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Upgrade Design for Septage Treatment: Pease Tradeport Wastewater Treatment Plant, Portsmouth, New Hampshire

Katherine Lynn Hedberg
Worcester Polytechnic Institute

Rita Ping Newman
Worcester Polytechnic Institute

Ryan Christopher Clark
Worcester Polytechnic Institute

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Upgrade Design for Septage Treatment

Pease Tradeport Wastewater Treatment Plant – Portsmouth, New Hampshire



Pease Wastewater Treatment Plant (Portsmouth City Council, 2015)

A Major Qualifying Project Proposal Submitted by:

Ryan Clark
Katherine Hedberg
Rita Newman

March 4, 2016

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Abstract

This Major Qualifying Project was completed in conjunction with Stantec to design upgrade options to increase septage treatment capacity at the Pease Wastewater Treatment Plant in Portsmouth, NH. Designs modernized existing technologies and suggested methods to treat glycol waste. Following a site visit, data analysis, design alternative development, and cost estimates, designs were scored in health and safety, environmental and sustainability, economic, and constructability criteria. This project proposes one short-term and one long-term design to resolve existing and future problems.

Capstone Design Statement

The Design Problem

The Pease Wastewater Treatment Plant (WWTP), located in Portsmouth, New Hampshire, was in need of new septage receiving design solutions. The plant often operated at capacity and the system was in need of upgrades to generate additional revenue and accept a glycol waste from a local biopharmaceutical company. This waste represented the potential to provide “food” for the microbes over the low-flow weekends, thus keeping the system stable and avoiding the Monday system shock. In collaboration with Stantec, this Major Qualifying Project (MQP) proposed several alternative designs to create a more robust system. Each design alternative contained cost estimates developed through collaboration with vendors and manufacturers. The benefits and disadvantages of each design were weighed through consideration of economic, environmental and sustainability, constructability, and health and safety constraints.

The Approach

Review of existing WWTP drawings and data, a site visit, and consultation with plant operators and Stantec engineers provided a full understanding of the plant operations. The team developed five alternatives that addressed the capacity improvements and the glycol waste. The design options were reviewed by Stantec engineers to ensure they met the needs of the client.

Health and Safety Constraints

WWTP health and safety constraints are twofold. The health of the population served by the plant is affected, as is the health and safety of individuals working in and operating the plant. To best serve the community’s increasing need for septage treatment, each design accommodated higher intake than anticipated. To improve safety for plant operators, equipment with more operating hazards were avoided in design development.

Environmental and Sustainability Constraints

Developing sustainable, environmentally conscious designs was imperative. High-quality system components, manufactured to last for years without replacement, were preferred in design development. The environmental impact of relocating or expanding the septage receiving facility was also considered.

Economic Constraints

Cost estimates are an integral part of any engineering decision. Each estimate included the capital cost and operations and management expenses. They also considered whether the alternative encompassed the potential revenue from the glycol waste. To develop the estimates, the team contacted vendors to receive quotes for necessary equipment. Additionally, some values in the cost estimates came from RS Means.

Constructability Constraints

Existing physical land resources also create limitations in implementing design. Some design alternatives required construction or more physical space than would fit within existing plant facilities. Designing lengthy pipe connections between facilities also constrained options for system component placement. Timeline was another important factor because longer construction time would delay the potential income from the glycol waste.

Professional Licensure

Becoming a licensed Professional Engineer (PE) symbolizes that an individual is a skilled, ethical engineer that will provide quality work for clients. The license is required if someone is in charge of work, as only Professional Engineers can sign and provide their seal on engineering drawings. In this way, PEs are able to access career opportunities that are otherwise unattainable.

There are various steps that an individual must complete to receive a professional engineer's license. The first is to graduate from an accredited engineering program with a four-year degree. The next is to pass the FE, or Fundamentals of Engineering, exam. To get practice in the field, the engineer must work four years under the supervision of a licensed professional engineer. After all of these steps are completed, the engineer needs to pass the Principles and Practice of Engineering, or PE, exam to become officially licensed. However, the work does not end there. Many states require that Professional Engineers further their education and skills by taking more courses and utilizing professional development opportunities. Some of these may involve participating in web seminars, conducting independent studies, or attending events like the Professional Engineers Conference.

Obtaining the PE license is a sign of respect amongst engineering colleagues and trust between the PE and the communities they work for. The license explains that the engineer is competent and will work to make the communities safer. Obviously with this authority comes responsibility, as PEs are held accountable for the work they do and the lives that work affects. While the opportunities in a PEs career dramatically increase, they must constantly adhere to the ethically correct decisions to maintain their license and reputation.

Executive Summary

Septage is a liquid and solid waste which often contains high levels of grease, grit, hair, and large solids that can clog pipes and pumps (U.S. Environmental Protection Agency, 1994). With a high BOD concentration, it requires special treatment processes. Some facilities treat solely septage, though many wastewater treatment facilities treat it for a source of additional revenue. As long as the waste is pre-treated through a screen, it can be slowly combined with wastewater and go through the treatment process.

Located in Portsmouth, New Hampshire, the Pease Wastewater Treatment Plant (WWTP) is in need of new design solutions for its septage treatment process. The WWTP accepts between 50,000-220,000 gallons of septage each month. The existing receiving facility consists of pretreatment screening and temporary storage in two 7,000-gallon storage tanks. Each of these components has maintenance issues; rocks and rags build up in the screen and grit accumulates in the storage tanks. Additional problems result from limited septage handling capacity. Throughout the day, trucks unload at the facility and the waste that enters the storage tanks is pumped into the treatment plant system at 50gpm. Occasionally, the storage tanks reach maximum capacity before the end of day, resulting in overflow directly into the headworks facility. Although this has not yet caused organic overload problems for the system, nor violated the plant's NPDES permit for BOD levels, each design alternative presented here works to remedy operational problems and increase septage treatment capacity by 50% to prevent this unmetered overflow as demand increases over time.

The WWTP also hopes to accept glycol waste from Lonza Biologics Inc., a local biopharmaceutical company. Pease anticipates that Lonza will generate up to 3,500 gallons of glycol each week and that the waste will have a BOD of 200,000 mg/L. Although glycol does not require the same pre-treatment as septage, its high BOD concentration requires a very slow feed rate into the treatment system. Fortunately, this waste could potentially solve the problem of insufficient food for the microbes in the activated sludge Sequential Batch Reactors (SBRs). Due to seasonal and hourly changes in wastewater and septage flow, Pease experiences high and low-flow periods. During low-flow periods, which occur during weekends and winter months, the SBR microbes are starved. Glycol can serve as a supplemental food source and elevate BOD levels in low-flow periods to keep the microbes stable. To serve this purpose, glycol will require separate storage from septage for entry into the treatment process.

The first step to developing design alternatives was evaluating existing conditions. In 2014, Underwood Engineers, Inc., wrote a facility evaluation report for the Pease WWTP. The overall system review report included current drawings of the facility, tank volumes, BOD levels throughout the treatment process, notes about current and past system operations, and suggestions for potential improvements. The complete drawings of the existing treatment plant displayed the available land areas that could be utilized for various alternatives, such as buildings that will be abandoned in the coming years that could be repurposed and open spaces where new facilities could be constructed. On January 22, 2016, the MQP team conducted a site visit with Stantec engineer, Steve Calabro, PE, to confirm the information reported in the facility evaluation.

After evaluating existing conditions and understanding problems occurring at the facility, the team developed five design alternatives that provided a range of inexpensive short term solutions for urgent upfront problems, and long term solutions that require new construction and more costly upgrades. The design alternatives were evaluated on four criteria categories: health and safety, environmental and sustainability, economic, and constructability. Each category was broken down into more specific criteria, such as operator safety, energy consumption, reliability, and scalability.

The five design options are as follows:

Option 1: Maintain Current Operations

Continue to operate the plant as normal with current maintenance costs, while accounting for upcoming changes from headworks and odor control redesign.

Option 2: Upgrade Septage Receiving Facility (Short-Term Solution)

Increase capacity with an additional septage storage tank. Implement a flow meter, sampling port, pinch valve and rock trap. Create sloped area for truck delivery for gravity feeding. Add a card reader system for auto-billing.

Option 3: Repurpose Existing Headworks Facility for Glycol Receiving (Short-Term Solution)

Convert grit removal tank in the existing headworks into a glycol storage tank. Waste will be pumped gradually into primary clarifiers through the control box.

Option 4: Construct New Facility for Glycol Receiving, Adjacent to Existing Septage Receiving Facility (Short-Term Solution)

Construct new storage tank with small capacity for glycol. Waste will be gradually pumped into the primary clarifiers through the control box. Only pumps (no screens or grit removal) will be necessary to operate this tank.

Option 5: Construct New Septage Pretreatment and Glycol Receiving Facility Adjacent to Sludge Storage Tanks (Long-Term Solution)

Construct new facility to store glycol and the Septage Complete Plant. There will be one wet well for septage and one storage tank for glycol. The glycol will slowly be pumped to mix into the septage wet well. From there, the combined waste will be pumped into an empty sludge storage tank (repurposed as high-BOD mix storage).

Of the original design alternatives, the MQP team recommends two upgrade solutions: one for short-term and one for long-term. If Pease would prefer to make improvements immediately, the recommended option is to combine the ideas presented in alternatives 2 and 3. It is highly recommended Pease implements the updates presented in option 2 because they prevent organic overloading by increasing the treatment capacity of the receiving facility. The suggested upgrades will also provide accurate information on the quantity of septage the facility takes in, which may result in more income for the plant. By integrating the design for option 3, Pease will be able to meet the needs of Lonza and treat glycol, which may also boost plant revenue.

However, if Pease is interested in long-term solutions and has the budget for a larger upgrade project in the coming years, the best option would be to implement alternative 5. This option would require the most new equipment and structures. However, if Pease intends to expand its treatment capabilities, this option should enable the facility to operate at higher treatment capacity for several years following construction.

There are two factors that make the long-term option stronger than the short-term option, despite the considerably higher expense. First, option 5 addresses the need for storage capacity to feed the treatment process during low-flow periods, which enables Pease to treat more septage and glycol, thus generating more revenue. Second, this option fully addresses the problem of grit accumulation which results from lack of grit removal as part of septage pretreatment. If the MQP team were required to recommend a single design option for implementation that would meet the needs of the Pease WWTP, it would be to construct a new facility for septage pretreatment and glycol storage.

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The authors would like to sincerely thank their advisors, Professor Frederick Hart and Professor Suzanne LePage, for their time as they reviewed the report. This project also could not have been completed without support from Stantec. The MQP team would like to thank Joe Uglevich, PE, Steve Calabro, PE, and the rest of the engineers at the Burlington, MA office for their assistance. And a final thanks to the vendors who provided cost estimate quotes and the staff at the Pease WWTP in Portsmouth, NH, specifically Mike Baker, for their support on site and throughout the project.

Disclaimer: The information presented in this MQP report has not been checked or verified as accurate by Stantec and does not represent Stantec's opinions or recommendations as to functionality, appropriateness or costs.

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1. Introduction

As one of the Worcester Polytechnic Institute (WPI) degree requirements, students must complete a final Major Qualifying Project (MQP) and capstone design experience which will utilize knowledge acquired through coursework to practice professional design. This MQP was completed with Stantec at their Burlington, Massachusetts branch to redesign the septage receiving facility at the Pease Tradeport Wastewater Treatment Plant in Portsmouth, New Hampshire. Stantec is an international consulting company of more than 1,000 professionals in the water and wastewater engineering sector (“Water & Wastewater Engineering - Stantec,” n.d.). Stantec is committed to making water a sustainable resource and the environment a safer place through projects such as the upgrade of the Pease Wastewater Treatment Plant.

The Pease Wastewater Treatment Plant (WWTP) receives wastewater from the local area sewer system and septage is brought into the facility by trucks. Sometimes septage storage tanks reach maximum capacity before the end of the day, resulting in septage overflow into the headworks facility. Although this has not yet overloaded the system or created major problems, it would be ideal to increase storage capacity. Maintenance issues also exist due to rock and rag build-up in the septage pretreatment screen and grit accumulation in the storage tanks. This project focused on developing effective design options to increase septage capacity and reduce operational problems.

To develop a set of design solutions that met increasing demand at the Pease Wastewater Treatment Plant, the team achieved three objectives as follows:

1. Understand current Pease septage collection operations and problems
2. Design alternative solutions to increase Pease septage capacity and enhance performance
3. Select a solution, or combination of solutions, through consideration of economic, environmental, constructability, and health and safety constraints

2. Background

The goal of this project is to develop multiple design solutions that will meet increasing septage treatment demand at the Pease Wastewater Treatment Plant. This will be achieved by examining existing septage receiving facilities and proposing potential solutions to improve operations. The Background section of this report reviews information about the Pease Wastewater Treatment Plant, standard operations of septage treatment, and important facts about required system components.

2.1 Overview of the Pease Tradeport Wastewater Treatment Plant

The Pease Wastewater Treatment Plant (WWTP) is located on the Pease International Tradeport (Figure 1). It was constructed in 1954 and originally served the Pease Air Force Base. Since the WWTP opening, there have been modifications and changes of ownership. In 1990, the City of Portsmouth took over operations and management through an inter-municipal agreement (Arcadis, 2015). There were major upgrades done in 1997 and the current septage receiving facility was constructed in 2002 (Underwood Engineers Inc., 2014). The WWTP does not have a permit flow limit. Currently, it intakes 1.2 MGD and discharges treated effluent into the Piscataqua River. Of the total flow, 60% of the plant's organic loading is attributed to the Craft Brewer Alliance (Redhook Brewery) and Lonza Biologics. Together, the companies contribute 50% of the flow to the WWTP (Arcadis, 2015). The City of Portsmouth has another treatment plant, the Peirce Island treatment plant. Between these two facilities, there are 20 pump stations, 120 miles of sewers, and 3 combined sewer overflows.



Figure 1. Layout of Existing Pease Wastewater Treatment Plant (Arcadis, 2015)

In recent years, the demand for septage treatment has increased beyond the capabilities and capacity of Pease. For many wastewater treatment plants, the cause is population growth. Often, new homes in New England must be built further away from developed areas and are out of range of sewage lines (Burton A. Segall, 1980). Such homes require septic systems, thereby contributing to increasing demand for septage treatment. Many feasibility studies for the development and construction of septage receiving facilities will consider population and projected population growth in estimates for expected future septage volume (Dufresne-Henry, 2005). However, population projections were not considered in design development for this project. The Pease WWTP accepts primarily industrial septage and only small quantities of residential septage. Data from the past three years, in addition to comments from the Pease WWTP's Assistant Chief Plant Operator, indicated that there was no increase in septage received and there is no expectation it will increase. Thus, the goal of this project is to increase septage handling capacity by 50%, a conservative percentage for the small size of the existing septage receiving facility.

2.2 Septage Overview

Unlike sewage and other forms of wastewater, septage is exceptionally problematic. Despite the growing demand for treatment at wastewater treatment plants, there are limited options due to the high contaminant concentrations. The following subsections will further explain the complexities of treatment at Pease and the differences between septage collected at the WWTP and other wastes.

2.2.1 Contents and Classifications

Septage is liquid and solid waste collected in on-site wastewater disposal systems which are periodically pumped for treatment and disposal purposes. It often contains high levels of grease, grit, hair, and large solids that can clog pipes and pumps (U.S. Environmental Protection Agency, 1994). However, the exact concentrations and contents will vary by location. For example, a household tank is likely to contain less grease than the septage from a restaurant. To help differentiate the types and their likely contents, there are four main classifications (see Table 1).

Table 1. Septage Classifications (Metropolitan Council, 2013)

Classification	Description
Domestic	Waste collected in an individual septic tank (often household waste)
Commercial	Waste from a business or service establishment
Industrial	Waste from industrial or manufacturing processes
Brown Grease	Separate wastewater stream, collected from commercial or industrial sources

The Pease WWTP currently treats sanitary (domestic and commercial) and industrial septage. All of these forms of septage contain varying concentrations of grease. Grease must be carefully controlled to prevent harm to the treatment processes, particularly primary treatment. According to the EPA, treatment plants that accept both septage and sanitary wastewater should keep the grease content of the influent limited to 300 mg/L, and the skimming mechanisms in primary treatment should be modified to handle extra grease (U.S. Environmental Protection

Agency, n.d.). While grease is a component of septage, brown grease is a more concentrated form that can cause even more harm to treatment plants (see 2.2.3 Brown Grease).

It is important to recognize that septage content concentrations are affected by seasonal temperature changes. When taking samples in winter, it should be expected that some qualities, such as the total chemical oxygen demand (COD), may more than double during the summer (Halalsheh et al., 2010). This may partially be caused by a lack of rain during dry summers, which results in lower groundwater levels and less dilution (U.S. Environmental Protection Agency, 1994). At Pease, seasonal changes also impact expected treatment demand. During early summer (June) and mid-autumn (October), Pease receives peak highs of more than 200,000 gallons for either month. In late winter (February), the WWTP experiences peak lows of less than 40,000 gallons.

2.2.2 Glycol

In the future, Pease may accept glycol waste from Lonza Biologics Inc., a local biopharmaceutical company. The company generates substantial amounts of glycol waste with high levels of BOD, and is interested in having it treated at Pease. However, the facility is already operating at capacity, and may not be able to treat highly concentrated waste without developing a separate treatment process or designating a storage tank specifically for the waste. This potential future inflow was considered throughout the project design and development process.

Glycol is frequently used as a freeze protection agent and is also commonly used in the manufacture of pharmaceuticals. There are two primary types: ethylene glycol and propylene glycol. Each type has slightly different properties, such as viscosity and degradation time. When glycol comes in contact with water or bacteria, it has a tendency to become acidic waste (Berry & Browning, 2011). This lowers the pH of the fluid and increases corrosive properties that compromise metals. Ethylene glycol has stronger corrosion rates, but these can be substantially reduced through the addition of inhibitors and buffers which create “inhibited” glycol (see Table 2).

Table 2. Corrosion Rate of Inhibited/Uninhibited Glycol-Water Mixtures (Berry & Browning, 2011)

Corrosion Rate (MPY)					
Metal Type	Water	Ethylene Glycol	Propylene Glycol	Inhibited Ethylene Glycol	Inhibited Propylene Glycol
Mild Steel	9.69	44.50	9.80	0.04	0.04
Cast Iron	21.20	55.70	16.20	0.13	0.05
Copper	0.08	0.16	0.16	0.12	0.04
Brass	0.23	0.46	0.20	0.12	0.08
Aluminum	13.20	19.80	1.80	0.44	+0.36 (weight gain)

Currently, Lonza generates both types of glycol in large, concentrated quantities. The company expects to generate up to 3,500 gallons of glycol waste each week with an average BOD of 200,000 mg/L. Most of this waste will be ethylene glycol, which has less favorable

properties with regards to toxicity and corrosion. However, the waste will not have significant total suspended solids or high nitrogen levels.

2.2.3 Common Septage Treatment Methods

There are four primary methods to treat and dispose of septage (Table 3). The first two methods are sometimes preferred as natural options, whereas the latter two require treatment plants and are preferred for large quantities of septage. Currently, the Pease WWTP is utilizing the third listed method of co-treating septage with sewage at the headworks of the plant. This method is popular for many large wastewater treatment plants since the addition of septage often does not significantly disrupt plant operations. WWTP co-treating is also favored in many communities as a reliable year-round option for disposing septage.

Table 3. Methods of Septage Treatment (Gerardi, 2006)

Treatment Method	Process Description
Land Application	Apply stabilized septage over a large, open area as fertilizer either subsurface or on surface.
Co-Disposal of Solids	Compost the septage or add it into landfills
WWTP Co-Treatment	Drive the septage to a WWTP, or have it pumped through a manhole into the facility. Co-treat the septage with sewage at the headworks, or with sludge in sludge handling processes. Septage will receive biological and chemical treatment.
Independent Septage Treatment Plant	Drive the septage to a specialized facility for biological treatment, chemical oxidation, composting, and lime stabilization.

Since Pease is interested in continuing to treat sewage and septage, the other alternative methods listed will not be suitable for this MQP. To increase septage capacity, it is necessary to investigate alternative methods for delivering septage to the WWTP in addition to options for improving existing system components.

2.3 Septage Receiving Facility Operations

Each weekday, septage trucks from the surrounding communities drive their septage load to the Pease WWTP for treatment. The truck will unload at the septage receiving facility. The septage is screened and pumped into storage tanks. From there, the septage is automatically pumped into the headworks facility once tank volume depth exceeds 30". The following subsections detail the way septage receiving facilities typically operate and include details specific to Pease operations.



Figure 2. Overview of Pretreatment Process

2.3.1 Receiving Station

The septage receiving station serves three main purposes for wastewater treatment plants: transfer, pretreatment, and storage. The transfer station is where septage is moved from the hauler trucks into the facility for preliminary treatment consisting of screening, grit removal, and storage (U.S. Environmental Protection Agency, n.d). The design of a septage receiving station varies based on key factors: septage volume, truck volume, type of preliminary treatment, odor considerations or requirements, and type of downstream treatment and disposal.

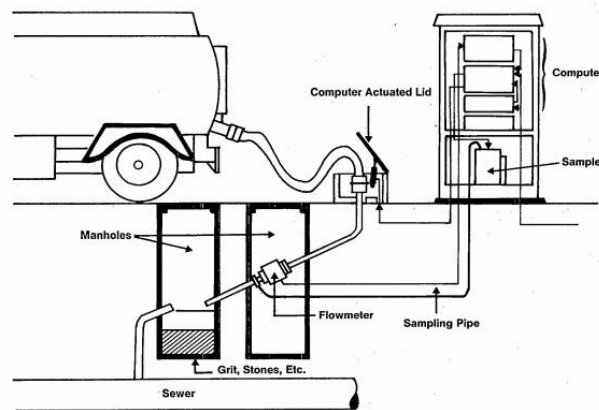


Figure 3. Example of a Receiving/Dumping Station

The dumping station is the initial point of receiving septage where haulers hook up to the system and pay for the use of the facility. There should be a slightly sloped ramp to tilt the truck for complete drainage and facilitate hosing down of spillage to a central drain (U.S. Environmental Protection Agency, n.d). In designing the amenities for the dumping station, installation of an automatic billing and paperwork process or key card access is important for pre-registered haulers to dump after-hours. In addition, it provides for a more efficient billing process for the plant.

In the design phase, if there is heavy hauler traffic at the plant or the plant intends to increase the number of haulers coming to the site, multiple discharge locations should be considered, each with unloading docks and hose connections (U.S. Environmental Protection Agency, n.d). Each of these unloading docks should be inclined or on a slope. If an existing dock is not inclined or sloped, an alternative is to depress the area where the equipment is located and lower the inlet valve. This way, the truck can completely empty by gravity flow. Another option is to incorporate a hydraulic lift that can be raised or lowered as needed (U.S. Environmental Protection Agency, n.d).

To ensure the station can handle the range of daily flow, the estimated volume of septage entering the facility and the rate it passes through the pretreatment processes must be accurately estimated (U.S. Environmental Protection Agency, n.d). A meter could be implemented so the exact volume entering the system is known. For example, the City of Allegan in Michigan implemented a system with a card reader, flow meter and valve. This system provides the options of sampling, storing, and automatic billing. The key card operation allows for select access to the facility 24/7. To gain this access, haulers had to fill out a credit application for proper billing, provide proof of proper insurance, and provide a performance bond (Allegan Municipal, 2013).

Various amenities for the haulers can be included, such as a restroom, hoses, and other wash-down equipment that will aid clean up. Sometimes steam equipment is needed for colder climates to aid thawing in lines and valves. The types of hoses used for the connections are watertight and have a quick release discharge tube and the ability to extend the discharge tube below the liquid level in receiving chamber to prevent release of odorous gases (U.S. Environmental Protection Agency, n.d).

2.3.2 Screen System

Screening minimizes the potential wear or harm to equipment by removing large solids and grit (EPA, 2003). The screening process typically uses two types of screens: coarse screens for larger objects, and fine screens for smaller materials. Both screens are used to remove material that may create operational and maintenance problems, especially in systems that lack primary treatment. Table 4 and Table 5 below outline various screens and the solids they each remove (EPA, 2003).

Table 4. Types of Coarse Screens (EPA, 2003)

Name	Description
Trash Rack	Removes logs, timbers, stumps, and other large debris Opening size is 1.5"-6" (38mm-150mm)
Manually Cleaned Bar Screen	Used in smaller treatment facilities or in bypass channels Removes large solids, rags, and debris Opening size is 1"-2" (30mm-50mm) Bar set at 30°-45° from vertical
Mechanically Cleaned Bar Screen	Used primarily in new installations Removes large solids and other debris Opening size is 0.25"-1.5" (6mm-38mm) Bar set at 0°-30° from vertical

Table 5. Types of Fine Screens (EPA, 2003)

Name	Description
Average Fine Screen	Opening size is 0.06"-0.25" (1.5mm-6mm)
Very Fine Screen	Removes suspended solids at a level comparable to primary clarification Opening size is 0.01"-0.06" (0.2mm-1.5mm) Bar set at 30°-45° from vertical

Cleaning the debris out of the screen system is essential to ensure that water can still pass through. A traveling screen, shown below in Figure 4, is a mechanically cleaned fine screen system. Its sections rotate upward and are cleaned with water sprays when they rotate to the head enclosure (Viessman, Perez, & Chadik, 2009). A mechanically cleaned medium screen system is commonly used to replace a manually cleaned coarse screen (Viessman et al., 2009). The debris collected can then be buried on land or incinerated, depending on the suitability of the options.

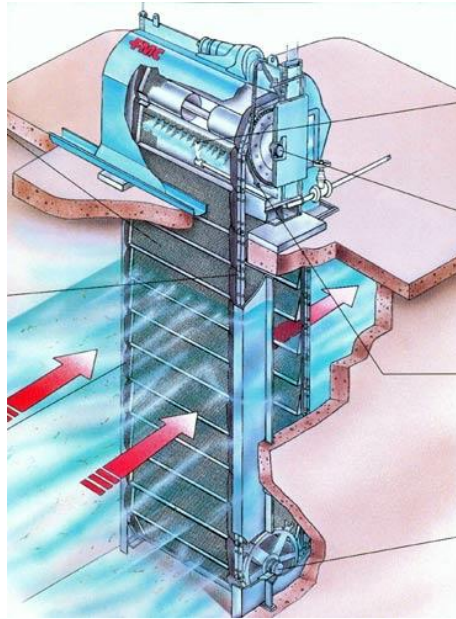


Figure 4. Traveling Screen

For septage receiving stations, mechanically cleaned bar screens are most desirable and any parts in contact with septage should be made of stainless steel (U.S. Environmental Protection Agency, n.d). When designing the screen, it is important it can handle larger quantities than expected and heavier material than what is expected (U.S. Environmental Protection Agency, n.d). The State of New Hampshire sets design and capacity requirements for the sizes of openings and how they are to be cleaned. Sections 708.25, 709.01, and 709.02 of the New Hampshire Code of Administrative Rules outline the requirements for septage receiving stations and screen systems (New Hampshire Code of Administrative Rules, 2014).

2.3.3 Grit Removal Systems

Grit removal occurs after screening to prevent abrasion and wear of mechanical equipment, as well as accumulation of rocks and grit in pipelines, channels, anaerobic digesters and aeration basins (EPA, 2003). Examples of grit, which are heavier than organic biodegradables, include sand, gravel, food waste, and bone chips (EPA, 2003). For design purposes, grit is defined as fine sand, or 0.2-mm-diameter particles with a specific gravity of 2.65 and settling velocity of 0.075 fps (Viessman et al., 2009). Several types of grit removal units are used and vary based on the amount of grit in the wastewater, size of the plant, convenience of operation and maintenance, and costs of installation and operation (Viessman et al., 2009). When implementing the grit removal system, the team must comply with New Hampshire regulations (New Hampshire Code of Administrative Rules, 2014).

The optimal situation is that after the septage passes through the screen system, it travels by gravity to the grit removal stage to avoid wear on pumps. Sometimes that situation is unavoidable and if that is the case, "recessed-impeller or other grit-resistant pumps" should be utilized (U.S. Environmental Protection Agency, n.d.). There are two main types of grit chambers: horizontal flow and aerated. However, the horizontal flow chamber is ineffective at removing grit from septage because the flow is not strong enough to break apart the grit from scum and other solids (U.S. Environmental Protection Agency, n.d.). The aerated grit chamber

pumps air into the septage, resulting in a spiral flow that allows the grit to settle. There are hoppers at the bottom of the chamber that collect the grit. The grit can then be removed by a centrifugal pump or a screw conveyer (U.S. Environmental Protection Agency, n.d.).

Cyclone degritters are an alternative to the aerated grit chamber. They are beneficial when septage is dumped directly into the pretreatment process because they operate in batch operation mode (U.S. Environmental Protection Agency, n.d.). Additionally, cyclone degritters generate less odor than the aerated grit chamber. When designing a cyclone degritter, the main consideration to account for is the flow velocity. However, in a situation where the average solids concentration is more than 2%, cyclone degritters may not be the best option for grit removal (U.S. Environmental Protection Agency, n.d.).

At the Pease WWTP, the only grit removal system present is located in the headworks. After the septage leaves the storage tanks, it is combined with the sanitary wastewater and then passes through headworks. Since there is no stage in the pretreatment process for grit removal, grit accumulation in the storage tanks becomes a problem.

2.3.4 Storage Tanks

Storage tanks can be placed either before or after the septage undergoes pretreatment. The benefit of placing the tanks before pretreatment is that if grit removal is included in the pretreatment, the flow rate through the grit chamber can be better controlled. However, it is not recommended that pumping occur before grit removal because that can cause excessive damage to the pumps. In such a situation, grit-resistant pumps would need to be utilized (U.S. Environmental Protection Agency, n.d.). If the tanks are placed after pretreatment, the grit removal system must have enough aeration and capacity to handle the loading and flow rates from the septage trucks (U.S. Environmental Protection Agency, n.d.).

The Pease WWTP has two 7,000-gallon storage tanks made of precast concrete located after the pretreatment (Underwood Engineers Inc, 2014). These tanks are equalize flow and mitigate variations between septage loads. Two essential characteristics of these tanks are mixing and aeration because they prevent the organics from settling and allow for better treatment of the septage (U.S. Environmental Protection Agency, n.d.). Additionally, it is common practice to have enough available capacity to store the maximum expected amount of one day's worth of septage.

One major problem with the storage tanks is that Pease's current capacity is sometimes not enough for the plant to store all of the pretreated septage. There is overflow built into the storage tanks so once they reach capacity, excess septage is carried directly to headworks for treatment. In addition to the previously mentioned grit accumulation, rocks have made it through the screen system and accumulated in the storage tank. Together, these factors reduce the available volume in the tanks.

2.3.5 Feed Pumps

Feed pumps move the pretreated septage to meet the main wastewater line and move onto the next stage of treatment. The pumps move septage through the system at a desired constant velocity to accommodate the system loading caused by the wastewater inflow. Pumping devices consist of a control unit, motor, pump, check valve, and various other valves and fittings (Korving, Clemens, & Van Noortwijk, 2006). To determine the pump type most applicable for a specific purpose, factors including water classification, energy use for operation, and maintenance costs should all be considered (Ackermann, 2003).

Another important factor in pump selection is the range of flows that may be desired throughout the day. It is ideal for a pump to feed water at a regular, consistent rate (Grundfos, n.d.). However, since some estimates claim that an “average flow” of wastewater may double in high-flow conditions, or may decrease to only half in drier periods, it may be advisable to use those varying flows to increase or decrease septage flow throughout the day ("Wastewater Treatment," 2003). Regardless of flow rate variation, pump design must accommodate flow efficiently. When pumps are unable to perform at design capacity (possibly as a result of age), the pump has effectively failed and must be reassessed.

In sludge and septage handling, there are two types of preferred pumps: kinetic (rotodynamic) pumps and positive displacement pumps (Water Environmental Federation, American Society of Civil Engineers, & Environmental & Water Resources Institute, 2010). Kinetic pumps are generally less expensive and require less space and maintenance. However, positive-displacement pumps are not affected by fluid viscosity, making them ideal for pumping fluids with high solids concentrations. Applied to septage, positive displacement pumps are generally favored, and will therefore be the primary pump classification considered in this report. See Section XXYY--- for more specifics on the pump types considered.

The piping systems that convey the outflows from the pumps have important specifications as well. Pipe strength must resist internal pressure, handling, earth and traffic loads. Pipes should ideally withstand corrosion and abrasion, in addition to expansion and contraction due to changing temperature conditions. Additionally, valves, couplings, unions and other fittings must all be carefully selected to prevent leakage ("Wastewater Conveyance," 2010).

2.3.6 Odor Control Systems

Wastewater entering treatment plants often contain odorous compounds that can escape through open channels or are generated as byproducts during treatment processes. Septage has very strong odors, which causes concern to local residents. To prevent harm from odors, local governmental agencies created odor control ordinances (WEF & ASCE, 1992). Addressing odor control must come in the early design phase where the engineer consults local and state rules and regulations concerning odor control. Methods to control odor emissions from wastewater include prevention, chemical treatment, preaeration, and air scrubbers, along with other systems such as adsorption, biological, combustion, and mist (WEF & ASCE, 1992). In order to prevent odors, good facility maintenance is needed to minimize the formation of anaerobic conditions that cause odors to occur. The other methods are more complex when odors cannot be prevented. The advantages and disadvantages to these methods can be seen in the below Table 6.

Table 6. Methods of Odorous Air Treatment: Advantages and Disadvantages (WEF & ASCE, 1992)

Methods of Odorous Air Treatment: Advantages and Disadvantages		
Odor Systmes	Advantages	Disadvantages
Absorption	Simple operation	Costly media regeneration
	Reliable and consitent	Absorbent capacity used rapidly
	Additives can enhance treatment	Additives can cause corrosive environment
	Can accommodate varying gas flows	Particulate material can plug media
Biological	Simple operation	Require substantial space
	No regernerate chemicals	Reliability sometimes questionable
	Treat variety of compounds	Gas transfer limitations
	Economical to treat high volume of gas	Process control limited
		Particulate material can plug media
Combustion	Reliable at high temperatures	Costly if dedicated system
	Oxidize compound not treated chemically no biologically	Can cause problems with incinerator
		Backup system required when incinerator not in use
Ozonation	High potency oxidant	Costly
	Simple operation	Experience significant operating problems
		Difficult to control dosage
		High maintenance costs
Wet Scrubbers		Toxic off-gas if not properly destructed
	Wide-scale use	Recycle odorour compounds
	Can economically treat high gas flows	High chemical regenerant usage
	High mass-transfer efficiency	Can be high maintenance
	Effectively handles changes in odorous compound concentrations	Chemical carry-over in treated gas
Mist		Applicable to only certain compounds
	Low pressure drop	High energy requirement
	Accommodate high flow rate	High maintance
	High mass-transfer efficiency	Mist carry over in treated gas
	No chemical regenerant recycle	Slow response to changing concentrations

In the current contract with Pease, Stantec is designing a new odor system that will be separate from the plant's current chemical scrubber system. The current system is comprised of a packed tower, recirculation pump, exhaust fan, sodium hydroxide (NaOH) metering pumps, sodium hypochlorite (NaOCl) metering pumps and collection/discharge ductwork (Underwood Engineers Inc., 2014). It is in need of significant rehabilitation because it's approximate 15 years old. Also, its load now contains high odorous compounds due to the contributions from a brewery and pharmaceutical manufacturer. The system will continue to have high operating costs due to the chemical usage and high operation and maintenance requirements. Additionally, the hydrogen sulfide is actually causing widespread corrosion problems at the plant (Underwood Engineers Inc., 2014).

2.4 Wastewater Contents

After passing through the septage receiving facility, septage is piped into the main wastewater line entering the treatment plant. This wastewater is approximately 60% industrial and 40% sanitary wastewater. Industrial wastewater typically contains chemicals, grit, and highly toxic materials. Sanitary wastewater is a combination of domestic waste and some industrial waste. Domestic waste typically contains human and animal solid and liquid discharges, household cleaners, garbage, and other household wastes ("Wastewater Treatment," 2003).

Currently, Pease does not experience problems from adding septage into its wastewater flows since the combination dilutes the septage enough to avoid overloading the treatment

system. However, knowing the contents of the wastewater and its respective classification are important as these factors determine likely contents and appropriate treatment practices. Moving onto the design stages, this knowledge will help determine limits for potential increases in septage flow rates.

2.5 Septage WWTP Co-Treatment Overview

In the existing system, septage is co-treated in the headworks facility with wastewater. Stantec recently redesigned the headworks facility for a large upgrade which will be implemented in coming years. This required building a bigger, completely new facility, closer to the primary treatment stage. Water entering the headworks is screened, grit is removed, and the water is pumped to primary treatment. In addition to protecting the downstream equipment from large debris, the headworks removes some highly concentrated pollutants that exist in wastewater. This reduces the cost to treat the wastewater later in the process and helps meet standards for the safe discharge of effluent into a body of water (Oyler, 2001).

The alternative to feeding pre-treated septage into the headworks is to feed it into the sludge removal process in primary treatment. The septage undergoes the same pretreatment process (screening) before being directed into the activated sludge process, which occurs in the sequencing batch reactors (SBRs). In this process, the influent and activated sludge are agitated and aerated. Then, sedimentation separates the activated sludge from the "mixed liquor" and the sludge is recycled into the process (Spellman, 2011). The treated wastewater then overflows from the tank to move onto the next treatment process. Sludge can be disposed of by land application, landfiling, incineration and out-of-state disposal (Wheeler et al., 2008). Figure 5 outlines this process.

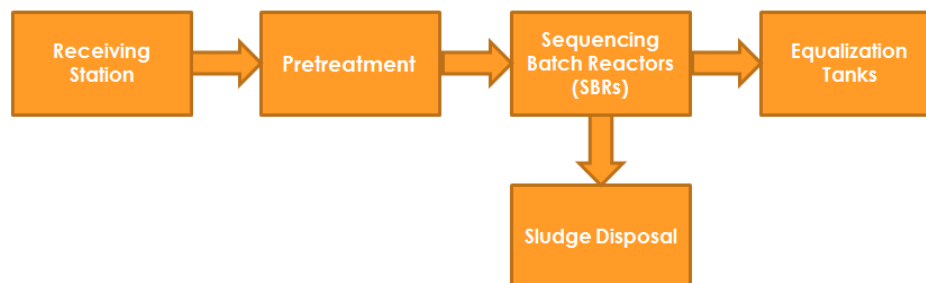


Figure 5. Alternative Septage Treatment Process

2.6 Water Regulations

Environmental impacts must be considered when designing a septage facility. Several unintentional adverse effects on the environment and/or human health can result during a facility upgrade. For example, increased truck traffic due to construction and improved WWTP capabilities may result in higher noise levels (U.S. Environmental Protection Agency, n.d). At the state and local levels, regulations for septage treatment vary. There are no overall regulations for strict licensing requirements, equipment used, pretreatment requirements, or allowable disposal practices. Although sometimes there is no formal regulation enforcement for local regulations, federal regulations are always enforced (U.S. Environmental Protection Agency, n.d). To address environmental concerns with septage and sludge management, there

are various regulations at the federal, state and local levels. Table 7 below summarizes the federal acts:

Table 7. Federal Acts Regulating Septage Treatment

Federal Acts	Description
The Clean Water Acts (CWA)	<ul style="list-style-type: none"> • Federal funding is made available for constructing facilities for municipal wastewater treatment and septage treatment/disposal • The Environmental Protection Agency (EPA) is in charge of issuing septage and wastewater sludge management guidelines and regulations • A research and demonstration program is developed to improve wastewater treatment and sludge and septage management practices • National Pollution Discharge Elimination System (NPDES) point source discharge regulations are released • Waste treatment and water quality management plans for non-point source pollution are implemented
The Resource Conservation and Recovery Act (RCRA)	<ul style="list-style-type: none"> • Federal financial assistance is given to state and local governments for solid waste management plans • Stringent regulations are required for the disposal of hazardous and non-hazardous materials, including septage
The Marine Protection Research and Sanctuaries Act (MPRSA)	<ul style="list-style-type: none"> • Ocean disposal of sewage sludge and septage is phased out due to its potential harm to human health and the environment
The Safe Drinking Water Act (SDWA)	<ul style="list-style-type: none"> • Further regulations are made to protect drinking water from contamination. This act supplements the CWA and RCRA
The National Environmental Policy Act (NEPA)	<ul style="list-style-type: none"> • If there are suspected adverse effects on environment, economy, and/or human health from a new or modified sludge or septage disposal facility or practice, it is up to regional discretion if an Environmental Impact Statement (EIS) is required
The Toxic Substances Control Act. (TSCA)	<ul style="list-style-type: none"> • In coordination with CAA and CWA, this restricts disposal of toxic wastes • Federal regulations only monitor sludge disposal for Polychlorinated Biphenyl (PBC)

The Pease wastewater treatment plant was issued a NPDES permit in August of 2000, which allowed discharge of treated effluent to the Piscataqua River (Arcadis, 2015). The requirements are summarized below in Table 8 (Underwood Engineers Inc., 2014). It states "Report" for flow as there is not a limit that the plant is able to receive. Pease is simply required to document their flows and submit that information to the New Hampshire Department of Environmental Services (NHDES). The permit does not limit total nitrogen or total phosphorus. However, a future permit will most likely include a limit for total nitrogen (Arcadis, 2015). An

evaluation study completed by Arcadis in June 2015 indicated that future wastewater treatment plant modifications would need to consider potential environmental impacts on native shellfish. Since the Piscataqua River and Great Bay are impaired water bodies, the City may require limits for anti-degradation of effluent (Arcadis, 2015).

Table 8. 2000-2005 NPDES Permit Discharge Limitations

Effluent Characteristic	Discharge Limitations		
	Average Month	Average Week	Max Day
Flow, MGD	Report	Report	Report
BOD ₅ , ppd (mg/l)	300 ppd, (30 mg/l)	450 ppd (45 mg/l)	500 ppd, (50 mg/l)
TSS, ppd (mg/l)	300 ppd, (30 mg/l)	450 ppd (45 mg/l)	500 ppd, (50 mg/l)
Fecal Coliform, colonies/100 ml	14/100 ml	14/100 ml	14/100 ml**
Total Residual Chlorine	0.75 mg/l		1.0 mg/l
pH	6.0 – 8.0 Standard Units		

• pounds per day = ppd

• milligrams per liter = mg/l

** Permit limit more stringent than other NPDES permits in the region

2.7 Design Constraints

Before considering possible design alternatives, it is important to fully understand factors that constrain potential improvements at Pease. The existing space throughout the facility is somewhat limited, and the distances between buildings for pumping treated septage must be considered. Another constraint involves physical flow of the main sanitary wastewater and the addition of pretreated septage and glycol. The amount of septage allowed into the sewage line is currently restricted to ensure that the WWTP systems are not chemically overloaded.

2.7.1 Physical Area for Expansion

While it would be beneficial to upgrade many components at the Pease WWTP, there are physical limitations to how much can be constructed. For example, though it would be ideal to add grit removal to the screen system, such an addition may not fit in the current septage receiving building. Ideally, it would be preferable to repurpose existing buildings whenever possible. Two buildings on site will be abandoned following the construction of a new

headworks facility. Thus, the existing headworks and current Control Operations building will be available for repurposing. Another factor to consider for constructability involves physical pipelines. The longer the pipeline, the more likely leakage may occur; thus it may be preferable to keep consecutive processes nearby to one another. However, this may be limited by available land area in suitable locations.

2.7.2 Septage Outflow Rate and Organic Loading

Another reason for limited septage flow into the system is organic overload. Organic loading is the amount of organic matter entering a treatment plant. In technical terms, it is the amount of BOD (biochemical oxygen demand) or COD (chemical oxygen demand) applied to a volume of filtered media. When a system is “overloaded”, it means the system is attempting to treat more BOD than the design capacity of the system allows. Typically, this occurs when a primary wastewater treatment system receives more waste than it was designed to treat (Spellman, 2003). This is problematic because insufficient organic treatment yields effluent water with higher total-coliform and fecal-coliform counts, which is unacceptable for plant permits (Halalsheh et al., 2010). Thus, organic loading is one of the biggest concerns a WWTP will have when choosing to accept septage for co-treatment.

Treatment of organic matter is particularly difficult chemically, and exacerbated by adding septage, which is approximately 50 times as concentrated as domestic wastewater (see Table 9). Currently, wastewater dilutes the added septage at Pease and is sufficient to avoid system overloading. However, the concentrations and flows of septage into the system should be carefully monitored and changed as is appropriate for effective plant operation.

Table 9. Significant Components in Domestic Wastewater and Septage (Gerardi, 2006)

Component	Range in Concentration (mg/liter)		Typical Concentration (mg/liter)
	Domestic Wastewater	Septage	Septage
BOD ₅	110–400	2,000–6,000	3,000
COD	250–1,000	5,000–80,000	30,000
Grease	50–150	5,000–10,000	8,000
NH ₄ ⁺	12–50	100–800	400
Phosphorus	4–15	50–800	250
TKN	8–35	100–1,600	700
TSS	100–350	2,000–100,000	15,000
VSS	80–275	1,200–14,000	7,000

3. Methods

The goal of this project was to develop several design solutions that modernize the current septage treatment system and allow for the acceptance of glycol waste at the Pease wastewater treatment plant. This approach offered the City of Portsmouth multiple options to choose from to upgrade the treatment plant. The WPI team also analyzed the benefits and disadvantages of each plan and suggested an option to best improve long term performance. The team presented the following three deliverables to Stantec at the end of the seven-week project work period:

1. Set of alternative septage receiving design plans to improve plant efficiency and capacity
2. Recommended design plan, complete with supportive reasoning in MQP report
3. Presentation of project evolution and conclusions

To develop desired deliverables, the team met the following objectives:

1. Understand current Pease septage collection operations and problems
2. Design alternative solutions to increase Pease septage capacity and enhance performance
3. Select a solution, or combination of solutions, through consideration of economic, environmental, constructability, and health and safety constraints

3.1 Evaluation of Existing Conditions

An initial literature review was the first step to evaluating existing conditions so the team could become aware of important design constraints and standard system operations. This knowledge was gathered through an extensive literature review and meetings with Stantec engineers.

The next step involved understanding the current conditions of the septage receiving facility and preliminary treatment process. In 2014, an engineering firm, Underwood Engineers, Inc., developed an overall system review report which included current drawings of the entire facility and suggestions for potential improvements. The document included tank volumes, BOD levels, and notes about current and past system operations. The existing drawings of the entire treatment plant displayed the available areas that could be utilized for various alternatives, such as buildings that will be abandoned in the coming years and open space where new facilities could be constructed.

Additionally, Stantec provided various flow and influent data. This data was analyzed to show trends between the flows, relations between septage and BOD/TSS, and how effective Pease was at removing materials to comply with their permit. The data also revealed seasonal patterns in peak flows and differences in flow between weekends and weekdays.

Another important component that helped in the facility evaluation was GIS data. This allowed the team to see the locations of the four towns from which Pease receives wastewater. While the plant also accepts septage from those four communities, their receiving facility takes in septage from other towns as well. The GIS Map in Appendix B displays the location of Pease and the surrounding septage receiving facilities.

3.1.1 Site Visit

To gain a better understanding of the operations at the Pease treatment plant and septage receiving facility, the MQP team conducted a site visit on January 22nd, 2016 with Steve Calabro, PE from Stantec. Questions developed prior to the visit were answered by the Assistant Chief Plant Operator, Mike Baker, who gave a tour of the facility and explained the processes at each stage of treatment. In the days following the site visit, the team acquired additional plant data for flows and effluent contaminant concentrations.

During and after the site visit, the team utilized a mobile application called PlanGrid, which helped organize notes and pictures taken. For more details about PlanGrid and the site visit, a site visit status report can be found in Appendix E.

3.2 Development of Design Alternatives

Before identifying specific alternatives, the team needed to understand the demand for additional treatment capacity. Although past influent flow data showed no significant change in septage influent since July 2012, it was recommended by Stantec engineers that storage volume increase by 50% to accommodate potential future increase in demand. The team also needed to consider storage and treatment for glycol waste. As a new waste for this facility, glycol poses different storage and integration challenges.

The team prepared five different design alternatives. These alternatives were created based on literature review, evaluation of current conditions at the septage receiving facility, and discussions with vendors, Stantec engineers, and Mike Baker. Limitations to design development included the existing layout and space available at Pease.

3.2.1 Cost Estimates

After designing the five alternatives, associated cost estimates were developed. The final estimates included initial costs, operation and maintenance costs, and overall life cycle costs with consideration of capital cost payback periods. Some costs were based on numbers from RS Means. These values are accepted by the industry for creating cost estimates and were recommended by Stantec for cost estimating. Other costs, particularly for equipment, were from contacting vendors.

Stephen Calabro put the team in contact with a local vendor who frequently works with Stantec in development of cost estimates. This vendor's company represents several manufacturers of various pieces of equipment necessary for wastewater treatment. In addition to this vendor, the team contacted four manufacturers for septage pretreatment equipment.

Contacting vendors played a crucial role in selecting pumps, rock traps, and grit removal systems. Unlike most of the required system components, which have standard costs associated with their installation (such as valves, piping, and concrete), these components vary widely in design, operation, and client satisfaction. In pump selection, it is standard practice for an engineer to provide vendors with two pieces of information about pump application: desired flow rate and the required total dynamic head (TDH). Vendors are then able to determine what pump model and motor will meet the need and provide a quote for the respective cost of that solution. This allows engineers to focus on other parts of design, and leave the selection of pumps to other experts. Vendors are also able to provide insight about pros and cons of specific pieces of equipment. In selecting rock traps and grit removal systems, for example, vendor input helped the team understand required maintenance work, costs, and special features the equipment.

3.3 Review of Design Alternatives

The design alternatives were evaluated on health & safety, environmental & sustainability, economic, and constructability criteria that were broken down into more specific criteria such as, operator safety, energy consumption, reliability, and scalability. The list was developed in partial reference to evaluation criteria used in a similar project for screen technology alternatives and from the Septage Management Feasibility Study for the Regional District of Okanagan-Similkameen (Conestoga-Rovers & Associates, 2010) (Olson, 2013). These criteria were placed into a decision matrix and each individual criterion was assigned a weight, ranging from 1-3, with three being the most important. The weight represents the importance of each criterion to the client, based on preliminary discussion with Mike Baker and feedback from Mr. Calabro. The decision matrix the team utilized is displayed below in Table 10.

Table 10. Decision Matrix

Primary Criteria	Specific Criteria	Description	Weight	Design Options				
				#1	#2	#3	#4	#5
Health & Safety	Operator Safety	Access hazards for O&M, exposure to septage	2					
	Regulatory Obligations	Ability to meet current permit levels	1.5					
Environmental and Sustainability	Energy Consumption	Energy used to process septage at each facility	1.5					
	Water Resources	Potential impact to surface water and groundwater resources	1					
	Nuisance Odor	Potential nuisance odors	2					
Economic	Reliability	Consistency of performance with variable system demands	2.5					
	Efficiency	How well the system is performing (i.e.: whether O&M is needed frequently)	2					
	Initial Capital Cost	Upfront equipment and installation cost	3					
	O&M Costs	Cost for parts upkeep and replacement	2					
	Business Expansion	Potential to support or link to local businesses	2					
Constructability	Timeline	Estimated time to completion	1.5					
	Integration	Ease of integrating design, given existing construction plans and existing structures	2					
	Scalability	Represents the physical space available to scale a facility to accommodate all inflows	2					
	Infrastructure	Whether additional infrastructure is needed to support operation	2					

When scoring, each alternative was assigned a value 1-5. Table 11 below illustrates the scoring system implemented for each criterion. Once the points were weighed and added, the best solution became clear.

Table 11. Scoring System for Decision Matrix

Value	Meaning
1	Poor
2	Below Average
3	Average
4	Good
5	Very Good

4. Results and Discussion

This chapter outlines the information the team gathered throughout the course of the project. Preliminary findings came from the site visit and data analysis. The team then developed five design alternatives, which are presented in detail in this chapter. Finally, the team evaluated the alternatives using the decision matrix to determine which one(s) Pease should implement.

4.1 Site Visit

The site visit on January 22nd with the Assistant Chief Plant Operator, Mike Baker, revealed that although there is no urgent need for improvements, there are areas throughout the system where improvements can be made in future. Significant problems noted during the tour include the following:

- The existing headworks and influent pump station, which is part of the control operations building, will all be replaced and abandoned by 2018. Team designs should attempt to repurpose these buildings whenever possible.
- After septage storage tanks fill, septage flows unmetered, directly into the existing headworks.
- Septage trucks need to use their internal pumps to “blow off” their contents because the connection point to the building prevents complete gravity feed.
- Trucks unload waste on an honor system (contents are not sampled beforehand)

The Pease plant utilizes a SCADA (Supervisory Control And Data Acquisition) system, which is shown in Figure 6. This system can monitor numerous parameters such as flow, and can even trigger automatic pumping when preset operation conditions are met. A full status report from the site visit can be found in Appendix E.

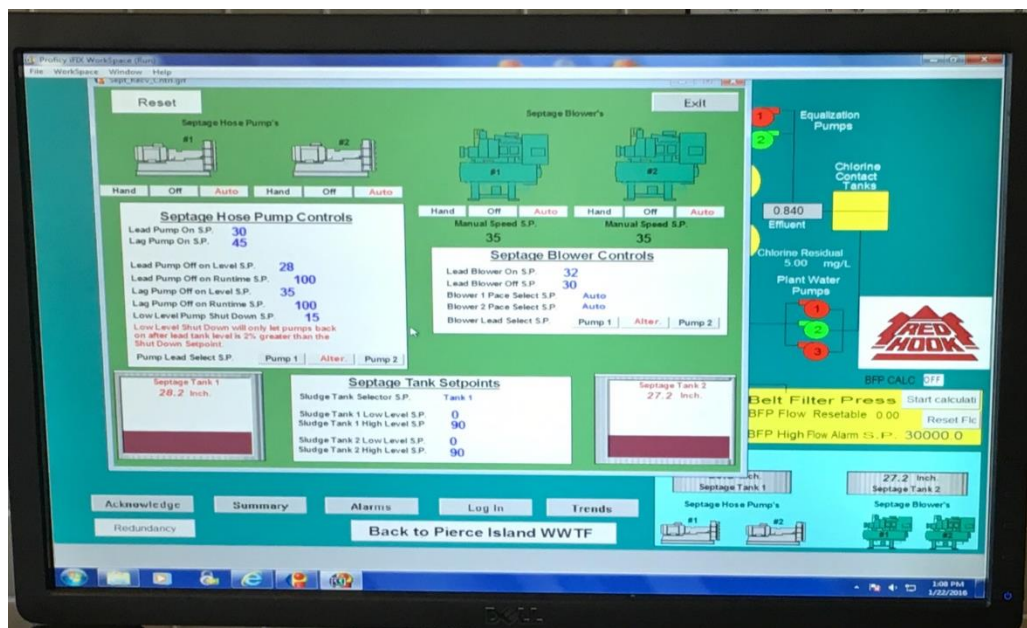


Figure 6. SCADA System at Pease

4.2 Data Analysis

To understand the current operations, it was critical to review data to identify trends in the treatment processes. This allowed the team to observe times when Pease tends to have extra capacity, which was critical for implementing of the glycol waste into the system and ensuring there is no septage overflow.

4.2.1 Treatment Flows and Capabilities

Currently, septage is pumped at a constant rate of 50gpm to combine with wastewater before entering the headworks. This rate is constant, regardless of wastewater influent flow rates. However, it may be better to schedule septage treatment so more septage can be treated when wastewater flows are low. This could prevent organic overload and also boost the food source for activated sludge microbes during low-flow periods.

Based on Pease flow rate records, the WWTP has operated at higher flows during weekdays than during the weekend for the last three years, with the exception of April 2014¹. Figure 7 shows the average hourly flow rate for weekends and weekdays at Pease for each month from 2013 to 2015. The consistently higher weekday flows indicate that the plant is capable of treating more wastewater and/or septage on weekends than it currently does.

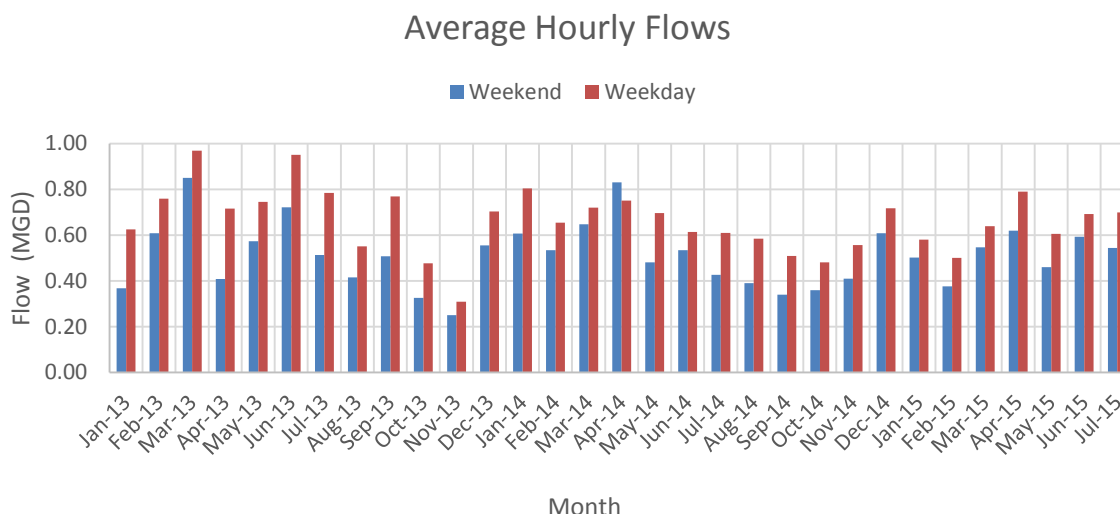


Figure 7. Average Hourly Flow Rates by Weekend and Weekday

4.2.2 Septage Receiving Data

Pease receives between 50,000-220,000 gallons of septage per month. Figure 8 displays the amount of septage received from July 2012-June 2015. As the graph shows, the summer months (June, July, and August) tend to have the highest amount of gallons received. On the other hand, the plant receives its lowest flows in the winter months (December, January, and February). This data displays that the plant has more capacity for treatment in the winter months.

¹ There is reason to believe that this exception is due to erroneous data. When the SCADA system fails, flow rates are automatically recorded as peak values. Operators go through the data to make adjustments where needed, but some data points were left unchanged. Given the clear trend in other months of data, this portion is likely incorrect.

For specific quantities, refer to the “Septage Volumes (July 2012-June 2015)” table in Appendix D.

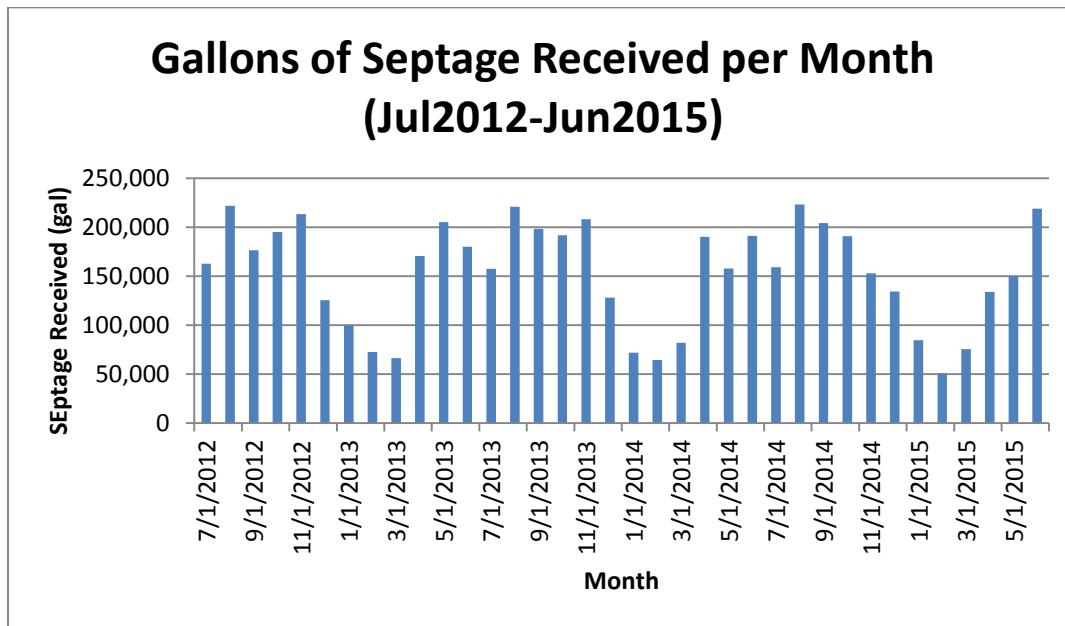


Figure 8. Septage Received from July 2012-June 2015

4.3 Overview of Design Alternatives

The team established five design alternatives, which are illustrated in Figure 9. Each alternative builds on one another in addressing existing operational problems at the treatment plant. The first couple of alternatives address urgent, upfront problems in relatively inexpensive ways. The latter designs include new construction and more costly solutions that may solve bigger problems in the long-run.

1. Maintain Current Operations

Continue to operate the plant as normal; consider maintenance costs and upcoming changes from headworks redesign

2. Upgrade Septage Receiving Facility

Increase capacity by 50%; update technology; create sloped area for truck delivery for gravity feeding; improve amenities for truck drivers; install card-reader system

3. Repurpose Existing Headworks Facilities for Glycol Receiving

Store glycol in existing headworks grit chamber; pump waste gradually into the intermediary pump station adjacent to the primary clarifiers

4. Construct New Glycol Receiving Facility Next to Septage Receiving Facility

Construct new glycol storage; pump waste into the intermediary pump station adjacent to the primary clarifiers

5. Construct New Septage Pretreatment and Glycol Receiving Facility

Construct new facility to store glycol and septage complete system; repurpose empty sludge storage tank as septage-glycol mix storage

Figure 9. Five Design Alternatives

4.4 Option 1: Maintain Current Operations

The first option was to do nothing to the system and operate as usual. However, as the system ages, there will be additional maintenance costs to keep the septage receiving facility operational. The general life cycle of equipment is roughly 20 years. Since the receiving facility was built in 2002, the City of Portsmouth should plan to replace system components, such as the screen system and pumps, around the year 2022. In addition to replacing equipment, the plant will need to continue paying to remove grit accumulation from the storage tanks. The assistant chief plant operator said this occurs twice a year.

A distinct disadvantage to this option is the absence of a septage receiving flow meter. The plant currently uses the honor system when haulers bring septage, so the plant does not have any exact readings for how much septage they actually take in, allowing haulers to merely estimate how much their trucks contain. If a flow meter were added, this would ensure accurate documentation of the amount of septage Pease receives. Often, haulers underestimate how much septage they treat at facilities, leading to under-paying. By adding a flow meter, the WWTP could generate more revenue for the treatment processes it provides. Section 4.11 explains the equipment that can be added. In addition to the flow meter, a sampler and pH sensor can be added as well so Pease can have data specifically for septage, considering they currently only have combined wastewater and septage.

Another important disadvantage is that if the City of Portsmouth decides to simply maintain current operations, Pease will be unable to generate a significant amount of revenue from treatment of glycol waste. The team calculated that Pease can charge up to \$7 per gallon of glycol waste on a septage equivalent basis, which could result in an additional \$840,000 each year from glycol alone (see calculations in Section XXX). Besides the economic benefits, the

treatment of glycol would further strengthen the partnership between Lonza and the Pease WWTP.

4.5 Option 2: Upgrade Septage Receiving Facility

Option 2 suggests several upgrades for the existing septage receiving facility. This option avoids constructing new buildings, but does not accommodate glycol waste. Thus, these upgrades could potentially be combined with the designs for glycol treatment included in alternatives 3 and 4.

4.5.1 Capacity

Although the septage receiving facility has two tanks, each with 7,000 gallon working capacity, Pease sometimes accepts more than 15,000 gallons of septage in a short time span. When this happens, septage overflows out of the tanks and is redirected out of pre-treatment, into the headworks at an unmetered rate. This is not good practice because it makes the organic loading on the wastewater treatment plant completely unpredictable. When septage is pre-treated and stored in the adjacent tanks properly, it can be pumped at a constant, controlled rate into the headworks. To make sure this procedure is always followed, a 50% increase in septage storage capacity is desired.

4.5.1.1 Current Septage Storage Tank Working Volume

To understand the extent of storage capacity problems at Pease, the team assessed existing conditions by reviewing the feasibility study written by Underwood Engineers, Inc., drawings of the facility, and information gained through the site visit. From this information, the team determined the actual working volume of the two storage tanks.

In most tank applications, dead space exists at the top and bottom of the tank. Pumps cannot remove septage from below their lowest suction point, and the space above the overflow outlet will not be utilized. Thus, the working volume is the space between the two dead spaces between the elevation at which pumps turn off (pumpOFF), and the elevation where overflow occurs. Another important thing to note is that most pumps do not turn on at the pumpOFF elevation; they turn on after an additional foot of septage has accumulated, at the pumpON elevation, as seen in Figure 10.

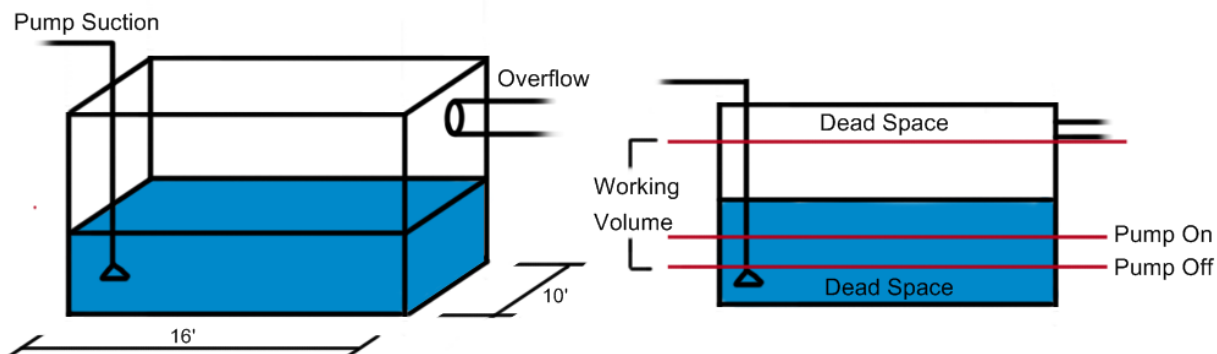


Figure 10. Working Volume of the Storage Tanks

According to the Underwood Engineers, Inc. report, the volume of each tank is 7,000 gallons. In facility drawings, the bottom of the tank is at elevation 31.62', the overflow is at

40.83', and the tank base dimensions are 10' X 16'. For the working volume to be 7,000 gallons, the pumpOFF elevation must be 34.98' to create a working volume depth of 5.85', as seen in the calculation below:

$$\begin{aligned}
 \text{Volume} &= L \times W \times D \\
 7,000 \text{ gallons} &= 7.48(16 \text{ ft} \times 10 \text{ ft} \times D) \\
 D &= 5.85 \text{ ft} \\
 D &= \text{overflow} - \text{pumpOFF} \\
 5.85 \text{ ft} &= 40.83 \text{ ft} - \text{pumpOFF} \\
 \text{pumpOFF} &= 34.98 \text{ ft}
 \end{aligned}$$

This means the pumps must turn on at elevation 35.98', which would require an extra 1,197 gallons of septage to accumulate, before pumps will turn on. This also means that approximately 3.36' of septage accumulate in the dead space at the bottom of the tank. With this 4,023 gallon space not being utilized, at least 36% of each tank's full volume is currently dead space.

4.5.1.2 Current Septage Storage Tank Fill Rate

The next operational consideration is how quickly the tanks fill with septage to the overflow elevation. Trucks typically take 20 minutes to unload and are usually either 3,000 or 5,000-gallon trucks. Therefore, the flow rates are 150gpm and 250gpm respectively. To maintain conservative fill-time calculations, the 250gpm rate is used throughout the following sections. It is also known that the pump that moves septage out of the tanks operates at 50gpm. As shown in Figure 11, this means the tanks must fill at approximately 200gpm. At this rate, a single tank would fill in about 35 minutes, so two tanks would fill in 70 minutes. Since each truck unloads in about 20 minutes, this means that three 5,000-gallon trucks could completely unload consecutively without causing overflow at present operating conditions.

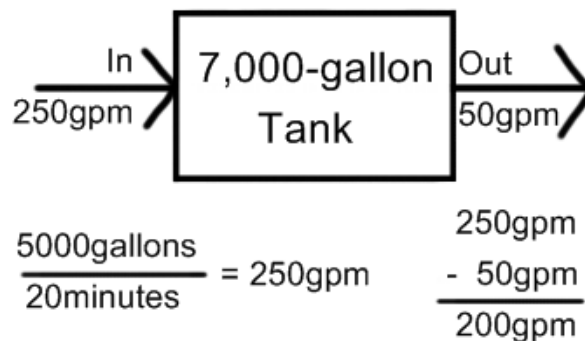


Figure 11. Tank Flow Diagram

4.5.2 Possible Solutions

Since only three 5,000 gallon trucks can be accommodated without causing overflow in current operations, but four or more trucks may arrive on a single day, the interest in increasing capacity is warranted. This can be achieved by implementing one or more of the following solutions: install a new tank, alter tank working volume by adjusting pump suction elevation, or upgrade the pump so outflow will be higher than 50gpm.

4.5.2.1 New Storage Tank

For system consistency, the most straightforward option to increase capacity is to construct a new replica storage tank adjacent to the two existing tanks (see CAD drawings in Appendix F). This would enable the new tank to be connected to the existing two tanks so all three could share the same odor control system, pumps, and pipelines.

Another method to increase capacity further is to change the automatic settings for septage pumping based on tank contents. Currently, each tank has an extra 4,000 gallons of unused capacity. It is unclear whether this large dead space was created by incorrect pump installation or operator preferences. In the first case, the pump suction line should be checked; if the opening could be lowered deeper into the tank, more working volume would be created. In the latter case, the automatic settings for the pumps could be adjusted. Instead of setting pumps to turn on after several feet of septage accumulation, they could be set to start pumping after less septage has accumulated. According to Steve Calabro, standard operation for a pump with a tank this size would require two feet from the bottom of the tank and 1 foot between pumpOFF and pumpON elevations. By increasing working capacity this way, Pease could potentially reduce the likelihood of needing to rely heavily on the overflow.

4.5.2.2 Replace Pumps

Another way to increase storage capacity is to alter pump operation. Currently, Pease operators are concerned with the capacity of existing hose pumps which move septage from the receiving facility to the headworks. If septage can be moved out of the tanks more quickly, more room will become available for additional septage storage which could avoid overflow conditions. The two Watson-Marlow/Bredel pumps each have a 50-gpm capacity, 15-ft of total dynamic head (TDH), and operate on single-speed motors at 7.5hp. Per typical operation, one pump is active, and the other is not used, serving as the standby. The application of positive displacement pumps for septage is suitable due to the high solids content and viscosity of septage. Thus, considering different pump styles within this classification was warranted. Other popular positive displacement pumps include progressive cavity, lobe, and double disc pumps. Due to the compact operations of Pease, progressive cavity pumps were preliminarily disregarded as they require significantly more floor space for operation. Remaining options of lobe, double disc, or hose pumps were studied.

Lobe pumps operate by carrying liquid between rotor lobe surfaces as they rotate. Timing gears are used to synchronize the rotation of each lobe as it carries pockets of fluid through the pump. Based on discussion with a vendor, lobe pumps have the appeal of infrequent required maintenance and flexibility in equipment components. Although the pump housing will never need to change, the lobes will need to be replaced for maintenance over time. If the operators are unsatisfied with the performance of a specific lobe type, they can try implementing lobes made out of different materials or cut in different shapes without spending excessive amounts of money on complete pump replacement. So far, Pease has yet to install a lobe pump, so its installation may create unforeseen and unexpected problems at the facility.



Figure 12. Lobe Pump (Borger, 2016)

At Pease, double disc pumps are utilized to move the contents of a 127,000-gallon sludge storage tank into dewatering once each week. Operationally, double disc pumps are relatively similar to diaphragm pumps. The suction discs are lifted from their seats in alternation to create vacuums and cavities that will move the fluid through the pump, as seen in Figure 13. So far, Pease operators have not expressed major complaints with their double disc pumps, but operators at other plants have complained about the number of required spare parts to conduct regular maintenance and repairs.

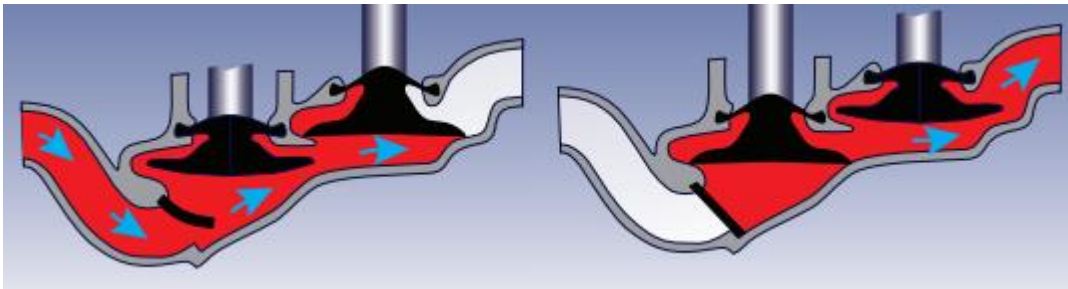


Figure 13. Double Disc Pump (Penn Valley Pump Company, 2011)

Hose pumps (peristaltic) are generally preferred for their minimal maintenance. Peristaltic pumps operate by squeezing a hose to move the hose contents through the pump. Thus, the only part that needs replacement is the hose itself (see Figure 14). The capital cost of these pumps is generally high, but due to the limited maintenance and their ability to handle abrasive liquids, they are generally favored by facility operators.

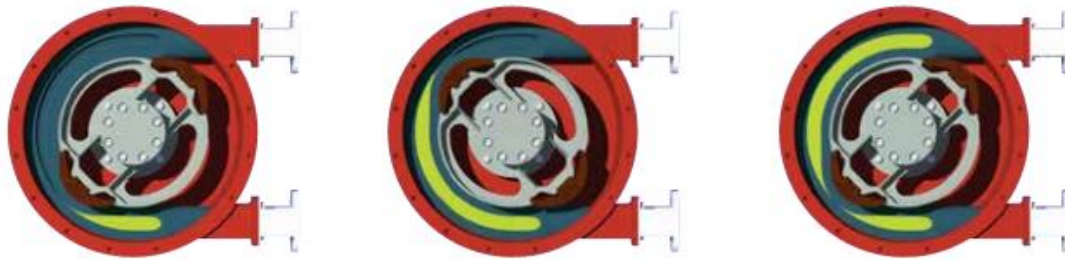


Figure 14. Peristaltic Pump (Watson-Marlow Bredel, 2015)

Although the hose pumps are more expensive, they are generally preferred by treatment plant operators. Since they are also used throughout Pease, operators are familiar with peristaltic pumps and are less likely to experience new problems when they are installed. Hose pumps also have yet to cause serious problems at Pease, so they were selected as the ideal type to use. For consistency in cost estimating, it is assumed that all 50gpm pumps required for alternative designs will be peristaltic pumps. Since hose pumps are not manufactured for high capacities, lobe pumps will be used for any capacity requirements over 100gpm. These pumps are relatively inexpensive and more operator-friendly when compared to double disc pumps.

4.5.2.3 Flow Meter & Inlet Valve

Capacity at the septage receiving facility is also impacted by the way trucks unload their septage into the facility. Without a valve or flow meter at the facility inlet, truck drivers can unload septage at any flow they want, which puts the plant at risk of becoming overloaded. Most septage receiving facilities implement several flow meters throughout the system to make sure that design flows are being safely met. Without a flow meter at the inlet, this practice is impossible.

The inlet also lacks a pinch valve. The Lakeside Septage Acceptance Unit can only accept a limited amount of septage to pre-treat before the unit would overflow or become damaged. Most units include sensors connected to a pinch valve at the inlet. This enables the tank of the unit to sense when it is filling too quickly and force the valve to shut temporarily. Adding an inlet pinch valve could help prevent damaging equipment.

4.5.3 Grit and Rock Removal

The existing septage receiving facility does not have a mechanism in place to remove rocks and grit from septage before passing into headworks. In terms of the grit, it accumulates in the septage storage tanks and requires operators to remove it twice per year. Since grit removal maintenance should only occur once every 5 years, or not at all in an ideal situation, the higher frequency of required maintenance has indicated an operational problem. The solution is to replace the Septage Acceptance Plant with a Septage Complete Plant, considering the complete plant contains grit removal. However, the complete plant is too large to fit in the existing septage receiving building, so the team did not consider adding the complete plant for this alternative.

On the other hand, rock accumulation is a problem this alternative does address. When large rocks are lodged into the septage acceptance system, operators must reach into the machine and use a hose to remove the rocks on a weekly basis. The rocks could easily damage the equipment and the maintenance puts the operators at an unnecessary risk. The simplest solution for reducing the buildup of large rocks is to install a rock trap. The manufacturer of the existing septage acceptance plant also manufactures rock traps that can be placed close to the facility

inlet. The rock trap works to remove dense, heavy rocks, and lets the liquid continue into the facility for pre-treatment. The rock trap can be maintained by removing a lid at the bottom of the housing to let rocks roll out. In many indoor systems, the rock trap will be contained in the same facility. Due to the smaller size of this facility, the rock trap is unlikely to fit, and will need to be integrated outdoors. This is a common solution for other facilities, even in New England, so the colder climate should not negatively impact the operation or maintenance of this additional equipment.

4.5.4 Improvements for Truck Drivers

Installation of a key card reader for an auto-billing system will help modernize the facility. This will allow Pease to hold haulers accountable and help accurately track the number of gallons received. A major benefit is if the treatment system is upset due to an overwhelming amount of septage, the plant would be able to identify which hauler caused the shock. It also is more convenient for haulers because if they need to dump septage after-hours or on weekends, the card access will provide them with this capability.

The area where trucks unload is at a lower elevation than the inlet valve to the receiving station, so truck drivers are forced to use internal pumps to “blow off” the remaining septage from their truck as it nears empty. The flow surge occasionally creates a mess that the truck drivers then need to clean up. If the area adjacent to the facility was higher than the inlet valve so the trucks could unload their septage with only gravity, it would be advantageous.

4.5.5 Odor Control

The Stantec upgrade will replace the existing chemical scrubber with a biofilter. The design options considered for the new odor control system was an activated carbon absorber or a biofilter. Table 12 shows the advantages and disadvantages between the systems and why the biofilter was chosen. Because the current system is beginning to fail due to its age, the old system will be retrofitted to include the biofilter, but will have the same design parameters.

Table 12. Odor Control Design Alternatives

Odor Control Design Alternatives				
Technique	Application	Cost Factors	Advantages	Disadvantages
Activated Carbon Absorbers	Low to moderate strength odors; small to large facilities	Cost-effectiveness depends on frequency of carbon replacement or regeneration	Simple; few moving parts	Only applicable for relatively dilute air streams; longevity of carbon difficult to predict
Biofilters	Low to moderate strength odors; small to large facilities	Low capital and O&M costs	Simple; minimal O&M	Design criteria not well established; may not be appropriate for very strong odors

4.6 Option 3: Repurpose Existing Headworks Facilities for Glycol Receiving

Design option three would address Lonza's glycol waste by repurposing the existing headworks for storage. This glycol has corrosive properties and a high BOD concentration, which necessitates separate storage from other types of waste. Repurposing the existing headworks by retrofitting corrodible materials would be a resourceful way to store glycol.

4.6.1 Repurposing the Existing Headworks for Storage

Due to the planned location of the new headworks facility, it will be necessary to demolish the existing headworks building and move its operations below grade. This way, trucks will be able to drive over the existing headworks location and onto the location of the new headworks. Since the primary purpose of the existing headworks will be relocated to the new facility, and moving the septage pre-treatment processes below grade will not be reasonable for maintenance purposes, it makes most sense to repurpose this building as a below grade storage tank.

Converting the existing headworks into a storage tank should be relatively simple. Currently, the floor of the structure is depressed, such that staff must walk down a set of stairs to reach the equipment on the floor. A major component of this facility is its grit chamber. At 8' X 8' X 8' deep, this tank currently has a volume of 5,964 gallons. If the walls of the tank were extended vertically up by 5', the volume would increase by at least 2,400 gallons, bringing the tank to about the same volume as the existing septage receiving tanks. With this added height, the tank would definitely have enough volume to store the biweekly glycol deliveries.

4.6.2 Glycol Flow Rate

Since glycol can bypass pre-treatment, it can be slowly bled from storage into a wet well, pump station, or storage unit to mix with the wastewater and go through the rest of the treatment process. It is crucial to determine an ideal rate for this flow, as a high glycol flow rate could disrupt the system's organic loading. Two methods of calculation were considered. The first relates the concentration (C) and flow rate (Q) of glycol to that of the rest of the wastewater in the system. If the two can be made to balance, the glycol can be added without substantially changing BOD daily concentrations. This is done as follows:

$$\begin{aligned}Q_{ww}C_{ww} &= Q_{glycol}C_{glycol} \\50gpm \times \frac{349.0mg}{L} &= Q_{glycol} \times \frac{200,000mg}{L} \\Q_{glycol} &= 0.08gpm\end{aligned}$$

The problem with this is that the flow rate is too slow for the anticipated quantities of glycol. If Lonza produces up to 3,500 gallons of glycol each week, it would be reasonable to expect one 5,000 gallon truck full of glycol every two weeks. At a 0.08gpm feed rate, it would take 40 days to process a single truck's contents, which means that the storage tank would be unable to accept a second load of glycol unless the storage capacity increased to accommodate this slow feed rate.

The alternative flow calculation considers design plan concentrations in relation to actual concentration data. Based on a mass balance drawing in the Underwood Engineers, Inc. report, the wastewater and septage that enters the headworks is expected to have an average daily BOD

concentration of 2,907 lb/d. However, water samples that have been taken from July 2012 to June 2015 indicate that the water that enters the headworks has an average daily BOD concentration of only 1,466 lb/d, with a maximum daily BOD concentration of 2,156 lb/d. This means that even at maximum concentration levels, there is still 751 lb/d of BOD that could be added to the system without exceeding the original design concentration averages. By converting from lb/d to mg/L, an ideal flow rate can be calculated. This is done as follows, where α is the glycol flow rate:

$$\frac{lb}{d} = \frac{mg}{L} \times 8.34 \times MGD$$

$$751 \frac{lb}{d} = 200,000 \frac{mg}{L} \times 8.34 \times \alpha MGD$$

$$\alpha = 0.00045 MGD = 450.24 gpd = 0.31 gpm$$

This rate is substantially faster, and would allow a 5,000-gallon volume of glycol to be treated in 11 days. However, it would increase the average daily concentrations at the plant too close to the BOD concentration limit. Instead, it may be better to use a flow rate between the two that have been calculated. If a 5,000-gallon volume can be treated within 14 days, it would meet Lonza's needs with less likelihood of overloading the system. The new concentrations and flows can be calculated as follows:

$$\frac{\text{Tank Volume}}{\text{Ideal Treatment Period}} = \frac{5,000 \text{ gallons}}{14 \text{ days}} = 357.14 gpd = 0.248 gpm = 0.000357 MGD$$

$$\beta \frac{lb}{d} = 200,000 \frac{mg}{L} \times 8.34 \times 0.000357 MGD$$

$$\beta = 595.71 \frac{lb}{d}$$

With a margin of 155.29 lb/d BOD, feeding glycol at 0.248gpm should be safe for the system. However, this feed rate should be flexible and vary throughout the day and across the week. When wastewater flows are low, the system will be able to handle additional glycol, and when flows are high, less glycol should be added.

4.6.3 Cost Benefits of Glycol Treatment

Due to its extremely high BOD levels, accepting and treating Lonza's glycol waste can justify a higher fee. The concentration of the combined septage and wastewater averages at 349.0 mg/L BOD, which actually fits within the concentration range for domestic wastewater listed in Table 9. The table also indicates that the BOD of septage may range from 2,000 mg/L to 6,000 mg/L. Unfortunately, Pease does not take samples of the received septage, so no data for septage BOD concentrations exist. The only data the team was able to acquire was for BOD concentrations for combined wastewater and septage. Pease does not take samples of the received septage.

To determine how much Pease can charge to treat the glycol, the team developed a range based on the average septage BOD range of 2,000-6,000 mg/L (see Table 9). Currently, Pease

charges \$0.07 per gallon of septage and the BOD of the glycol waste is about 200,000 mg/L. Assuming the septage concentration is 2,000 mg/L, Pease can charge \$7 per gallon to treat glycol. For the upper limit, Pease can charge \$2.33 per gallon. See the full calculation below (α represents the cost using the lower limit and β represents the higher limit). Since the actual concentration of the septage received at Pease is unknown, it is assumed for estimation purposes that the facility can charge a mid-range fee of \$5 per gallon for glycol.

$$\frac{\text{Average Septage BOD}}{\text{Glycol BOD}} = \frac{\text{Cost for Septage}}{\text{Cost for Glycol}}$$

$$\frac{2,000 \frac{\text{mg}}{\text{L}}}{200,000 \frac{\text{mg}}{\text{L}}} = \frac{\$0.07}{\alpha}$$

$$\alpha = \frac{\left(200,000 \frac{\text{mg}}{\text{L}}\right) \times (\$0.07)}{2,000 \frac{\text{mg}}{\text{L}}} = \$7.00$$

$$\frac{\text{Average Septage BOD}}{\text{Glycol BOD}} = \frac{\text{Cost for Septage}}{\text{Cost for Glycol}}$$

$$\frac{6,000 \frac{\text{mg}}{\text{L}}}{200,000 \frac{\text{mg}}{\text{L}}} = \frac{\$0.07}{\beta}$$

$$\beta = \frac{\left(200,000 \frac{\text{mg}}{\text{L}}\right) \times (\$0.07)}{6,000 \frac{\text{mg}}{\text{L}}} = \$2.33$$

4.6.4 Disadvantages

This alternative has two logistical disadvantages. First, the location of the existing headworks is far away enough from both the new headworks and the septage receiving facility that piping the glycol waste to either location would require about 30ft of piping. Glycol requires a very small pump, and a very low flow. The pump that meets these needs has a small hose that may not be easily installed over a 30ft distance.

Second, by placing the storage tank underground, it may be difficult to conduct maintenance. The tank lid would need to be flush to the ground, so the pump might need to be fixed onto a tank wall close to an access door. Glycol should also vent for odor control. Adding ventilation would incur additional cost and construction difficulties.

4.7 Option 4: Construct New Facility for Glycol Receiving

There are two primary reasons to consider constructing new storage for glycol receiving. First, glycol is acidic, and has potential to corrode metals. To maintain the safest operations possible, it is best to create a new storage area specifically designed to contain glycol. Second, the demand for treatment of glycol is a new one. If Lonza currently generates up to 3,500 gallons each week, this amount could potentially increase in the future. Due to the high BOD concentration of the glycol, treatment at Pease could also generate substantial revenue. Thus, the

plant should plan ahead with extra storage capacity. By constructing a new storage area instead of repurposing existing buildings, there will be less likelihood of unforeseen problems occurring. The two proposed locations are shown in Appendix F in the CAD layout. The first possible location is adjacent to the existing septage storage tanks, and the alternative is underneath or adjacent to the new headworks building.

As discussed in the previous section, Pease can charge anywhere from \$2.33-7 per gallon to treat glycol. If the plant charges more toward the upper limit, they may be able to construct new structures to accommodate the glycol with a relatively short capital cost payback period. Additionally, Pease and Lonza have a strong business relationship due to their geographic proximity. Should new facilities be constructed to accommodate Lonza, it may be possible that Lonza would help fund new construction. For these reasons, the upgrade and repurpose of existing buildings were considered in conjunction with the possibility of new construction.

The increased cost is obviously a disadvantage compared to simply repurposing existing buildings. The main difference between options 3 and 4, in terms of capital cost, is the expense of installing a new storage tank. As mentioned, it would be beneficial to pick this over option 3 because it allows for Pease to have more capacity for if Lonza increases their generation of glycol waste. However, if initial cost is a major limiting factor, option 4 may prove to be not worth the additional cost.

4.8 Option 5: Construct New Septage Pre-Treatment Facility and Glycol Receiving Facility

The final design alternative involved relocating the septage facility to ensure that it could house all the components necessary for septage pretreatment (rock trap, screening, and grit removal). This design also includes a built-in storage area for glycol. This keeps all of the concentrated wastes in the same area, with the proper storage and pre-treatment necessary. If repurposing abandoned structures seems too costly or does not meet the needs of the plant, new structures may be better options. Building a new structure to house these processes could reduce the need of serious maintenance for another 20 years.

In this design (see Appendix F), septage will be dumped at a new facility, constructed closer to the sludge storage tanks. The facility will pretreat the septage, redirect it into a small wet well, and pump it for storage into an empty 126,904 gallon sludge storage tank. Although this mix could be pumped directly into the sequencing batch reactors for use by the activated sludge microbes, it is better to add the mix into an early stage of treatment. Both septage and glycol do not need to go through the headworks because the septage is already pretreated and the glycol only needs to be treated by the biological processes. Based on the wastewater treatment processes at Pease, the team suggests pumping the mix into the control box that feeds the primary clarifiers. From there, septage will continue through the rest of the treatment process. This new facility will also be used to receive and store glycol. The glycol tank area will be located adjacent to the septage wet well so that glycol can be slowly pumped into the wet well and then pumped into the sludge storage tank to mix with the septage.

One of the unique elements of this design is the way it accommodates low-flow periods. By storing a mix of septage and glycol in the sludge storage tank, Pease will have continuous access to a high-strength waste which can be treated during low-flow periods. This mix can be bled into the system as a food source for microbes in the SBRs over weekends. The large volume of the sludge storage tanks also enables Pease to keep the concentrated mix on standby for longer periods of time than would be possible if small 7,000-gallon tanks were used.

This alternative would add a Septage Complete Plant for the pretreatment process. This would prevent Pease from cleaning out the grit accumulation in the storage tanks twice per year, thus saving in operations cost. This would also implement all of the upgrades to the Septage Acceptance Plant that the team suggested in design alternative 2, such as a flow meter, inlet valve, and rock trap. This, combined with the ability to have a large storage capacity for the glycol waste, makes this alternative the most reliable option and satisfies Lonza's need to treat the waste. The fact that this option allows for Lonza to increase the generation of glycol waste also strengthens Pease's business relationship with them and may lead to an increase in revenue.

The disadvantages to this include the time it would take to design and construct the facility, which results in lost potential revenue from not accepting the glycol waste for an extended period of time. Additionally, this alternative is obviously the most expensive option in terms of capital cost (\$1.4 million), a major consideration for the City of Portsmouth. With the construction of new facilities, the installation of new equipment, and the addition of an odor control system, the capital cost payback period is much longer.

4.9 Equipment Selections

The team contacted six vendors concerning septage receiving stations and pretreatment systems such as the complete plants, screens and rock traps. Below are the equipment selected for the designs.

4.9.1 Glycol Receiving Station (Options 3, 4, and 5)

The PortALogic DS-25 is a simple tamper-proof model easy for haulers to use. This station provides secure hauler access by PIN or swipe card and includes a pedestal base with an electrically actuated valve and flow meter. The equipment can operate outdoors in temperatures ranging from -40°F to 122°F and receive septage, fats-oils-grease, sludge, frac water and other waste flow up to 1,100gpm. More information on the PortALogic Waste Dump Station- Model DS-82 can be found in Appendix H.

Dump Station DS-25



Figure 15. PortALogic Waste Dump Station Model DS-25

4.9.2 Septage Receiving Station (Options 2 and 5)

The PortALogic DS-82 is a tamper-proof complete solution for waste receiving. The station provides secure access to haulers by PIN or swipe card. The station includes an electrically actuated valve, flow meter, sampler and pH sensor. The equipment can operate outdoors in temperatures ranging from -40°F to 122°F and receive septage, fats-oils-grease, sludge, frac water and other waste flow up to 1,100 GPM. More information on the PortALogic Waste Dump Station- Model DS-82 can be found in Appendix H.

Dump Station DS-82



Figure 16. PortALogic Waste Dump Station Model DS-82

4.9.3 Septage Complete Plant (Option 5)

The complete septage system the team selected was the Lakeside Raptor Septage Complete Plant, which combines screening and grit removal into one self-contained unit for treatment. More information can be found in Appendix H.



Figure 17. Raptor® Lakeside Complete Plant Model 31 SPA-A

4.10 Completed Cost Estimates

Cost estimates were an essential part of this project because there are large differences between all five alternatives. Table 13 below displays the cost estimate summary for the options the team developed. As anticipated, the costs associated with option 5 are the most expensive. Option 1 is obviously the cheapest option because it only reflects the money that Pease currently spends annually for regular operating costs. Option 2 appears more expensive than options 3 or 4 due to the considerations for septage treatment upgrade. Cost estimates for options 3 and 4 address only the costs associated with the integration and maintenance needed for glycol treatment. Thus, if option 3 or 4 is of interest in addition to option 2, the total costs can simply be added together. For the complete cost estimate breakdown, refer to Appendix G.

Table 13. Cost Estimate Summary

	Option1	Option2	Option3	Option4	Option5
Subtotal	\$244,200	\$312,400	\$30,800	\$49,060	\$1,025,200
Contractor OH&P (18%)		\$56,232	\$5,544	\$8,831	\$184,536
Contingency (30%)		\$93,720	\$9,240	\$14,718	\$307,560
Total	\$244,200	\$462,352	\$45,584	\$72,609	\$1,517,296

The \$20,000 difference in cost estimates for options 3 and 4 can be accounted for by the installation of a new storage tank in option 4. Since option 3 utilizes the grit tank in the existing headworks, this design costs less. The cost of option 4 is not excessively more than option 3

because it only involves installing the new storage tank for the glycol and this does not require a facility to be built around it. Both suggested placements of the tank for option 4 allowed the pump to be housed in either the new headworks or the existing septage receiving facility, thus saving the plant significantly.

The building cost really separated the fifth option from the rest because it is the only alternative that requires building a completely new facility. There was also a high cost for equipment because this option required new pumps and a Septage Complete Plant that costs \$276,000. Although this option is the most expensive, it is important to note that this is the only alternative that addresses the need for low-flow weekends and provides “food” for the microbes during those times.

It is interesting to note that maintaining operations costs \$238,000, and that for twice that amount, Pease could implement option 2 and have the septage receiving facility operate much more efficiently. However, if the facility had \$1million more available, the long-term design option 5 would become a possibility as well. It is also important to remember the capital cost payback period for design options that will treat glycol. At a \$5 per gallon treatment fee, and at least 10,000 gallons of glycol being treated each month, it would take only about one month for the costs of options 3 or 4 to be paid for. The cost of option 5 could be paid for with glycol fees alone within about two years.

4.11 Decision Matrix

After developing the five alternatives, the team completed a decision matrix to determine which alternative(s) would likely be the most beneficial for the Pease WWTP to implement. The completed matrix is shown below. Option 2 scored that highest, while option 1 was the lowest. For health and safety, all options scored at least a 3 for both sub-categories. There are no serious threats to both operators and the community with the facility operating as is, so any updates would only improve the current situation.

Option 1 was the only alternative to score below a 3 out of all of the environmental and sustainability criteria. This option scored a 2 for energy consumption because the septage trucks do not empty completely by gravity into the facility, resulting in the need for the truck to turn on its pump to remove the remaining septage. Additionally, the operators spend time once per week using a hose and their hands to physically remove debris from the screen system that builds up due to the trucks having to turn on their hoses. Every other alternative would ensure total gravity flow, which is why they all scored at least a 3 for energy consumption. For nuisance odors, all options received a 4 because there currently is not an odor problem at Pease and the various locations for options 3-5 would all be covered by the new odor control system Stantec is implementing with their headworks upgrade. For instance, if Pease decided to go with option 5, that building would simply be tied in to the odor control system and would not require the installation of a new system.

The economic criteria were weighed the heaviest because this is arguably the most important category to the client. The City of Portsmouth was already upgrading their other treatment plant, the Peirce Island WWTP, and there were various improvements already planned for Pease, such as the new headworks that Stantec was designing. That being said, it was very important that these options were economically efficient ways to improve the septage receiving process. The business expansion criterion was important because this included whether or not Pease would be able to accommodate Lonza and treat the glycol waste. The reason why option three only scored a 4 for this and options four and five scored a 5 was that the latter could be

built to whatever capacity Pease desires. In terms of reliability, option 5 was the only one to score a 5 because it has an extremely high capacity of 126,000 gallons for both septage and glycol. While the other alternatives have sufficient capacity, this option is more reliable because it takes advantage of the low-flow weekends and helps prevent the microbes from starving.

For the constructability criteria, the timeline criterion decreased going across the alternatives because more work is required with each option, thus delaying when the new facilities will be up and running. Options 4 and 5 scored a 1 for infrastructure because they did not repurpose any existing buildings. Option 4 required installing a new storage tank and option 5 involved constructing a whole new facility. For integration, option 2 scored a 4 because all of the updates, except grit removal, could be applied to the current facility and did not require expanding the building.

Table 14. Completed Decision Matrix

Primary Criteria	Specific Criteria	Weight	Design Options				
			#1	#2	#3	#4	#5
Health & Safety	Operator Safety	2	3	5	4	4	4
	Regulatory Obligations	1.5	3	4	4	4	5
Environmental and Sustainability	Energy Consumption	1.5	2	3	3	4	4
	Water Resources	1	3	4	3	3	3
	Nuisance Odor	2	4	4	4	4	4
Economic	Reliability	2.5	2	4	4	4	5
	Efficiency	2	2	4	4	4	4
	Initial Capital Cost	3	5	4	3	2	1
	O&M Costs	2	2	4	4	4	3
	Business Expansion	2	2	3	4	5	5
Constructability	Timeline	1.5	5	4	3	2	1
	Integration	2	5	4	4	4	4
	Scalability	2	3	3	2	4	4
	Infrastructure	2	5	4	4	2	1
Total			46	54	50	50	48
Weighted Total			90	104.5	97	96	91.5

5. Conclusion and Recommendations

Although the decision matrix clearly indicates that the preferable design option is alternative 2, it is important to note how heavily the economic criteria were weighed. Option 2 is economically the best option in that it proposes solutions for existing problems in inexpensive ways. However, it is also important to satisfy the needs of clients relying on Pease for its treatment abilities, and ensure that the plant is operating effectively and efficiently. For these reasons, the team proposes two recommended designs, neither of which is alternative 2 in its original state.

5.1 Economically Effective: Short-Term Recommendation

If Pease would prefer to make adjustments immediately, the best option would be to combine the ideas presented in alternatives 2 and 3. By integrating the design for option 3, Pease will be able to meet the needs of Lonza and treat glycol. The main advantage of option 3 over option 4 is that there is no need to install a storage tank specifically for the glycol, since the grit tank in the existing headworks would be repurposed to accommodate the waste. That is essentially the main difference between alternatives 3 and 4.

It is highly recommended Pease implements the updates presented in option 2 because it will ensure the system is not overloaded, expand the capacity of the receiving facility, and provide accurate information on the quantity of septage the facility takes in, which may result in more income for the plant. Additionally, implementing the ramp so the septage trucks can completely empty by gravity flow will result in less operational problems with the Septage Acceptance Plant.

5.2 Operationally Efficient: Long-Term Recommendation

If Pease is interested in long-term solutions and has the budget for a larger upgrade project in the coming years, the best option would be to implement alternative 5. This option would require the most new equipment and structures. However, if Pease intends to expand its treatment capabilities, this option should enable the facility to operate at higher treatment capacity for several years following construction.

To further develop this option, the team considered pump specifications and facility capacity. In order to move influent septage into the sludge storage tank, which sits 24 feet above grade, it is necessary to utilize pumps. Since the sludge storage tank would be the primary storage location for the septage, a small wet well under the new facility, connected to powerful pumps, should effectively move the septage quickly into storage. To prevent wet well overflow, it will be necessary for the septage to exit the wet well at, or near, the same flow rate at which it enters the facility. This can be achieved by using a 150-gpm pump at the bottom of the wet well. Since the largest truck volume should be 5,000 gallons, the wet well and glycol storage tank should each have a working capacity of at least 5,000 gallons. To be safe, the team decided that the same tank size currently used at the existing septage receiving facility (7,000 gallons) could be used in this application. Figure 18 illustrates these specifications and the path of septage and glycol flow within the new facility.

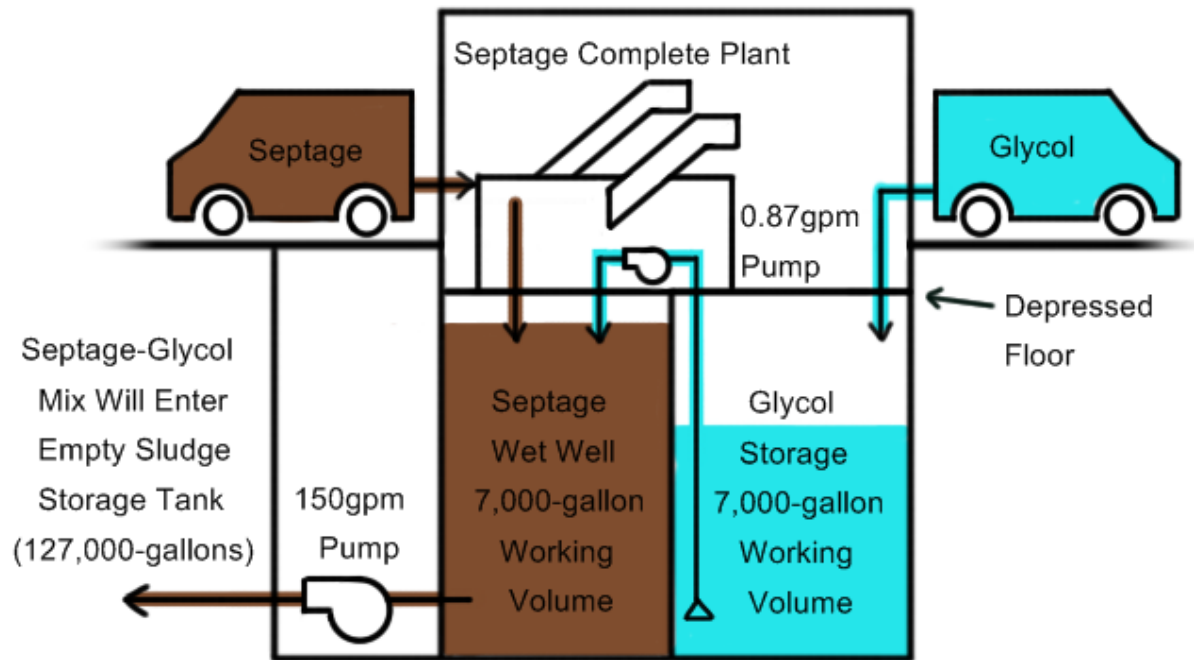


Figure 18. Configuration of Option 5

There are two factors that make this option stronger than the short-term option, despite the considerably higher expense. First, this option has the storage capacity needed to feed the treatment process during low-flow periods and will enable Pease to treat more septage and glycol, generating more revenue. Second, this option fully addresses the problem of grit accumulation. If Pease intends to increase its septage treatment capacity, problems with grit accumulation will increase as well, unless conditions are changed. Due to the size of most grit removal systems, the only way such equipment could be housed is through the construction of a new facility. Another major advantage for this over the short term option is this significantly increases the capacity to receive septage. The existing facility's capacity for septage is 14,000 gallons, while this option would account for over 126,000 gallons for both glycol and septage. Pease would be able to market their expanded capacity, which may result in even more revenue.

5.3 Recommendations for Future Study

Due to the short time-span of this project, there are several areas of study that would help ensure the accuracy of cost estimates and design recommendations. If time permitted, the team would investigate the following areas.

5.3.1 Septage Flows and Concentrations

Throughout this project, it was assumed all 3,000 gallon and 5,000 gallon trucks of septage take 20 minutes to empty into the septage storage tanks. It was also assumed that each truck tank was completely full when entering the plant. Without data from a flow meter, these assumptions were necessary for preliminary calculations to determine ideal tank volume and

required pump flows. To make the calculations for this equipment more accurate, it would be necessary to obtain more accurate data about the flow rate and quantity of septage leaving trucks. This could be achieved by installing a flow meter at the facility inlet connection point and collecting data for at least one year to capture all potential seasonal changes in flow.

Since the septage is not sampled prior to entering the facility, no data exists for initial BOD concentrations. Due to seasonal and locational variation in septage concentrations, it would be ideal to sample septage from each regular collection location at least once each week. If accurate data was collected for one year, a more accurate fee for glycol treatment could be developed. The facility could also determine if they are actually accepting more or less BOD concentration than originally assumed, which could result in a change in the baseline septage treatment fee.

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Appendix A: Proposal

Septage Receiving and Treatment Upgrade Design Proposal

Pease Trade Port Wastewater Treatment Plant – Portsmouth, New Hampshire



Pease Wastewater Treatment Plant (Portsmouth City Council, 2015)

A Major Qualifying Project Proposal Submitted by:

Ryan Clark
Katherine Hedberg
Rita Newman

January 11, 2016



Abstract

Combined wastewater inflow exceeds capacity at the Pease Wastewater Treatment Plant. To maximize cost benefits by treatment of inflow water, the plant must be retrofitted to increase capacity. This can be achieved by implementing new screen and grit removal systems to prevent solid waste buildup and developing an alternative pump station design to maximize efficiency and decrease energy consumption. This project will enable Stantec to select a solution that will meet economic, environmental, constructability, and safety constraints for improved performance.

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1.0 Introduction

As one of the Worcester Polytechnic Institute (WPI) degree requirements, students must complete a final Major Qualifying Project (MQP) and capstone design experience which will utilize knowledge acquired through coursework to practice professional design. This MQP will be completed with Stantec at their Burlington, Massachusetts branch to redesign the Pease Trade Port Wastewater Treatment Plant in Portsmouth, New Hampshire. Stantec is an international consulting company of more than 1,000 professionals in the water and wastewater engineering sector (“Water & Wastewater Engineering - Stantec,” n.d.). Stantec is committed to making water a sustainable resource and the environment a safer place through projects such as the upgrade of the Pease Wastewater Treatment Plant.

The Pease Wastewater Treatment Plant (WWTP) is an existing sewage receiving and treatment facility. Currently, holding tanks are at maximum capacity, resulting in occasional overflow, which causes an inconvenience to the community and a loss in revenue for the facility. Maintenance issues also exist due to rock and grit accumulation in the holding tanks. This project will focus on cost effective design options to remedy overflow situations and reduce operational problems. As part of the scope of this project, the team will assess existing conditions on the site and conduct cost analyses for various design options.

To develop a set of design solutions that will meet increasing demand at the Pease Wastewater Treatment Plant, the team will achieve three objectives as follows:

1. Understand current Pease headworks operations and problems
2. Design alternative solutions to increase Pease capacity and enhance headworks performance
3. Select a solution through consideration of economic, environmental, constructability, and health and safety constraints

2.0 Background

The goal of this project is to develop multiple design solutions that will meet increasing demand at the Pease Wastewater Treatment Plant. The Background section of this report reviews information about the Pease Wastewater Treatment Plant, standard operations of wastewater treatment plants, and important facts about headworks components.

2.1 Overview of the Existing Pease Tradeport Wastewater Treatment Plant

The Pease Wastewater Treatment Plant is located on the Pease International Tradeport. It was constructed in 1954 and originally served the Pease Air Force Base. Since the WWTP opening, there have been modifications and changes of ownership. In 1990 the City of Portsmouth took over operations and management through an inter-municipal agreement (Arcadis, 2015). The WWTP does not have a permit flow limit. Currently, it intakes 1.2 MGD and discharges treated effluent into the Piscataqua River. Because the WWTP takes on 60% of the load and 50% of the flow from the Craft Brewer Alliance (Redhook Brewery) and Lonza Biologics, meeting permit limits can be challenging (Arcadis, 2015). The City of Portsmouth has another treatment plant, the Peirce Island treatment plant. Between these two facilities, there are 20 pump stations, 120 miles of sewers, and 3 combined sewer overflows. Figure 1 below displays the layout of the Pease Wastewater Treatment Plant.



Figure 1. Layout of Existing Pease Wastewater Treatment Plant (Arcadis, 2015)

2.2 Project Scope and Wastewater Classification

The project description provided by Stantec (received on September 17, 2015 via e-mail) informed the team about existing system problems and desired design work. The description indicated that the sewage water being collected led to problematic rock and grit accumulation within the treatment plant. The contents of the water and its respective classification are important as these factors determine the processes and respective equipment necessary to treat plant intake. Wastewater is typically generated by several sources, as listed below:

Table 1. Waste Sources ("Wastewater Treatment," 2003)

Waste Source	Description
Human and animal	Solid and liquid discharges (most dangerous to human health)
Household	Household cleaners, garbage, other waste from homeowners
Industrial	Industrial discharge: chemicals, grit, highly toxic materials
Storm water runoff	From community infrastructure: grit, street debris, road salt
Groundwater infiltration	Groundwater with grit may enter old improperly sealed pipes

Due to the wide range of wastewater sources, there are five primary classifications:

Table 2. Wastewater Classification ("Wastewater Treatment," 2003)

Water Classification	Description
Domestic (sewage)	Human and animal wastes with some groundwater infiltration and industrial waste
Sanitary	Mostly domestic waste with some industrial waste
Industrial	Industrial waste only
Combined	Sanitary wastewater and storm water runoff
Storm water	Storm water only

Given these classifications and the project description, it is assumed that the Pease Wastewater Treatment Facility intake is combined water. There are three combined sewer overflows in the City of Portsmouth's wastewater system, at least one of which is likely associated with the Pease Wastewater Treatment Plant (Department of Public Works, 2012). This assumption was used to conduct the rest of the background research about potential system components.

2.3 Headworks Overview

The project description also noted the team can utilize an “abandoned below-grade headworks facility” for potential upgrade designs. To do this, the team must examine the existing headworks of the wastewater treatment process, which removes inorganics such as sticks, stones, grit, and sand. The headworks is essential as it protects the downstream equipment from damage and wear. This equipment includes: pumps, mechanical screens, and grit removal systems. In addition to protecting the downstream equipment, the headworks removes some highly concentrated pollutants. This reduces the cost to treat wastewater later in the process and helps meet standards for a safe discharge of effluent into a body of water (Oyler, 2001).

It is essential to invest money in improving treatment facilities or there can be serious damage and failures, which happened to the Lowell Regional Wastewater Utility. Due to a lack of funding, insufficient repairs were conducted for about ten years, and as a result the Utility experienced “a series of catastrophic failures” (Young, 2011). After those failures, the facility implemented various capital improvements, such as four new screw pumps, new influent screens, and updated grit screening.

2.3.1 Pump Operation

Pumping stations move wastewater throughout the system at a desired velocity. Pumping devices consist of a control unit, motor, pump, check valve, and various other valves and fittings (Korving, Clemens, & Van Noortwijk, 2006). To determine the pump type most applicable for a given treatment plant, factors including water classification, energy use for operation, and maintenance costs should all be considered (Ackermann, 2003).

Another important factor to consider is the range of flows that a facility may experience on any day. Some estimates claim that an “average flow” may double in stormy high-flow conditions, or may decrease to only half in drier periods (“Wastewater Treatment,” 2003). Whatever the flow rate is throughout the day, pump design must accommodate that flow efficiently. When pumps are unable to perform at design capacity (possibly as a result of age), the pump has effectively failed and must be reassessed.

The piping systems that convey the intake and outtake flows to and from the pumps have important specifications as well. Pipe strength must resist internal pressure, handling, earth and traffic loads. Pipes should ideally withstand corrosion and abrasion in addition to expansion and contraction due to changing temperature conditions. Additionally, valves, couplings, unions and other fittings must all be carefully selected to prevent leakage (“Wastewater Conveyance,” 2010).

2.3.2 Screen Systems

As part of the pretreatment process, screening minimizes the potential wear or harm to equipment by removing large solids and grit (EPA, 2003). The removal of larger grit is important to prevent problems in wastewater treatment such as jamming and excessive wear. The screening process uses two types of screens: coarse screens for larger objects, and fine screens for smaller materials. Both screens are used to remove material that may create operational and maintenance problems (especially in systems that lack primary treatment). Table 3 and Table 4 below outline various screens and the solids they each remove (EPA, 2003).

Table 3. Types of Coarse Screens (EPA, 2003)

Name	Description
Trash Rack	Removes logs, timbers, stumps, and other large debris Opening size is 1.5"-6" (38mm-150mm)
Manually Cleaned Bar Screen	Used in smaller treatment facilities or in bypass channels Removes large solids, rags, and debris Opening size is 1"-2" (30mm-50mm) Bar set at 30°-45° from vertical
Mechanically Cleaned Bar Screen	Used primarily in new installations Removes large solids and other debris Opening size is 0.25"-1.5" (6mm-38mm) Bar set at 0°-30° from vertical

Table 4. Types of Fine Screens (EPA, 2003)

Name	Description
Average Fine Screen	Opening size is 0.06"-0.25" (1.5mm-6mm)
Very Fine Screen	Removes suspended solids at a level comparable to primary clarification Opening size is 0.01"-0.06" (0.2mm-1.5mm) Bar set at 30°-45° from vertical

Cleaning the debris out of the screen system is essential to ensure that water can still pass through. A traveling screen is a mechanically cleaned fine screen system. Its sections rotate upward and are cleaned with water sprays when they rotate to the head enclosure (Viessman, Perez, & Chadik, 2009). A mechanically cleaned medium screen system is commonly used to replace a manually cleaned coarse screen (Viessman et al., 2009). The debris collected can then be buried on land or incinerated depending on the suitability of the options.

The State of New Hampshire sets design and capacity requirements for the sizes of openings and how they are to be cleaned (New Hampshire Code of Administrative Rules, 2014). Final designs will need to comply with these requirements.

2.3.3 Grit Removal Systems

Grit removal occurs after screening to prevent abrasion and wear of mechanical equipment, as well as deposition and accumulation of rocks and grit in pipelines, channels, anaerobic digesters and aeration basins (EPA, 2003). Examples of grit, which are heavier than organic biodegradables, include sand, gravel, food waste, and bone chips (EPA, 2003). For design purposes, grit is defined as fine sand, 0.2-mm-diameter particles with a specific gravity of 2.65 and settling velocity of 0.075 fps (Viessman et al., 2009). Several types of grit-removal units are used and vary based on the amount of grit in the wastewater, size of the plant, convenience of operation and maintenance, and costs of installation and operation (Viessman et

al., 2009). When designing the grit removal system, New Hampshire regulations must be complied with (New Hampshire Code of Administrative Rules, 2014).

3.0 Methods

The goal of this project is to develop several design solutions that will meet increasing demand at the Pease Wastewater Treatment Plant. This approach will offer Stantec multiple options to choose from in implementing upgrades at the treatment plant. The WPI team will also analyze the benefits and disadvantages of each plan and suggest an option to best improve long term performance. The team will present the following three deliverables to Stantec at the end of the seven-week project work period:

1. Set of alternative headworks design plans to improve plant efficiency and capacity
2. Recommended design plan, complete with supportive reasoning in MQP report
3. Presentation of project evolution and conclusions

To develop desired deliverables, the team will work to meet the following objectives:

1. Understand current Pease headworks operations and problems
2. Design alternative solutions to increase Pease capacity and enhance headworks performance
3. Select a solution through consideration of economic, environmental, constructability, and health and safety constraints

3.1 Schedule of Tasks

The timeline to complete this MQP is from January 14th to March 4th. Although the team will likely continue project work during weekends, only weekdays are listed in the timetable below. Each week focuses on a different team goal.

Table 5. Anticipated Project Completion Schedule

Goal/Important Events	Date Ranges
Stantec Orientation	Jan 14-15
Martin Luther King, Jr. Day	Jan 18
Review Existing Facility Drawings & Initial Site Visit	Jan 19-22
Evaluation of Conditions	Jan 25-29
Develop Design Alternatives	Feb 1-5
Prepare Cost Estimates	Feb 8-12
Review Design Alternatives	Feb 15-19
WPI Career Fair (Students may take the day off)	Feb 18
Finalize Deliverables (2 weeks)	Feb 22-March 4

3.1.1 Stantec Orientation: Jan 14-15

The initial days will be spent settling into the office, meeting supervisors, and becoming acquainted with existing resources for the completion of project work.

3.1.2 Review Existing Facility Drawings & Initial Site Visit: Jan 19-22

The first full week will establish a better understanding of permit requirements and current operations at the Pease Treatment Plant through review of existing drawings and operation data. This period may also help to refocus the project scope if necessary. Ideally, the team hopes to visit the facility and collect information as follows:

- Confirm that components shown in site drawings are accurate
- Take photos as needed for use in report, presentation, and future reference in system evaluation and development of alternative designs
- Visit the abandoned headworks facility and record information for use in possible upgrade designs
- Speak with system operators to gauge their understanding of existing problems and their thoughts on potential solutions. Questions during discussion may include:
 - What is the power and age of each pump? Have you noticed their performance decrease in efficiency?
 - What is the current average daily flow of the plant? What are the peak flows?
 - What solid matter exists in the wastewater that flows into the facility?
 - Describe the problems that the plant currently faces. Can you identify a direct cause of these problems?
 - Do you have any suggestions for ways to improve the efficiency of the existing system?

3.1.3 Evaluation of Conditions: Jan 25-29

After reviewing drawings and a site visit, existing conditions and machinery can be further evaluated.

For pump design, the most important information is desired flow to pump, the actual composition of the wastewater, and the local conditions of the pump station (Ackermann, 2003). Without careful calculation of flow, pumps may not operate at the levels they were designed for. Having a pump of the wrong size is both inefficient and can lead to damage. Most advanced wastewater treatment plants have monitoring equipment already in place, such as a SCADA (Supervisory Control And Data Acquisition) system or AMI (Advanced Metering Infrastructure). These systems can monitor several qualities of water, such as flow, and can even set alarms for potential issues like sewer overflow (Atkinson, 2015). If Stantec has records of this data for the Pease plant, the team will be able to determine if the pumps are operating efficiently given their design. If the data collected seems inaccurate, or no data is being collected at all, the team will need to investigate options for system monitoring since this is the best way to accurately measure flow and ensure efficient system operation.

The contents of wastewater is also critical for selecting the right pump as different solids will cause different problems. One recent issue has been an increase in the use of flushable wipes, which has caused problems for sewage plants. Instead of dissolving the way they should,

these wipes “form into strips during the treatment process and reform into larger balls” (Brzozowski, 2015). In submersible pumps, this clogging requires maintenance teams to enter the confined space surrounding the pump and remove the accumulated waste. This process is unsafe for maintenance workers but often occurs regularly due to frequent pump clogging. Some plants that are aware of this issue have chosen to install stronger pump impellers which grind and shred the wipes more successfully, thereby preventing clogging. However, since these impellers require more power, they incur more cost, so they should not be used unless proven necessary. In this way, wastewater contents dictate the appropriate pump mechanisms to use in a system. Granted, selected pump components must still physically fit the local conditions of the pump stations, unless complete reconstruction and upgrade of the stations is desired.

To reduce the existing operational problems from rocks and grit accumulating in the holding tanks, the team will evaluate the existing screen system’s physical conditions and sizes of openings and compare them to the sizes of particles and materials entering the system. One way to evaluate the efficiency of grit removal is to determine the percent removal of various particle sizes and biological degradable materials (Olson, 2013). The team will also determine what type of materials are passing through the screens into the holding tanks, and whether resizing or installing different screens would be appropriate. It is assumed the plant has both coarse and fine screens, but this is something the team will need to confirm in their evaluation as that is an important part in the treatment process. The screens can be either mechanically or manually cleaned. If the plant manually cleans the screens, that certainly can be upgraded as mechanically cleaned is the more updated, efficient process. Following the screens, the grit systems must capture any materials that pass through the screens. Any visible build-up of grit is an indication that the grit systems might need updating. Additionally, feedback from the plant operators is essential to collect as they continuously work with the system and understand it best.

3.1.4 Develop Design Alternatives: Feb 1-5

After evaluating the existing facility, the team will determine which components need to be improved or replaced and develop multiple design alternatives. Literature review and research will generate ideas for possible solutions which will be assessed based on known information about the system.

One significant design consideration that can change pump efficiency is the arrangement of pumps. It is common for pumps to be arranged in parallel, where one pump operates as the “duty pump” and the other is only used occasionally, as the “standby pump” (Microbi, 2015). However, the use of vacuum-primed series pump arrangements proves to be advantageous in high head pumping applications. By pumping in concert (simultaneously), flow rates will remain constant while the heads produced by each pump will be added. While this arrangement may save substantial operational cost, it will require two additional series pumps in standby, resulting in a higher initial cost (Microbi, 2015). Beyond the arrangement of the pumps, the actual speed and power of each pump must be considered in design, along with impeller specifications.

The opening between the screen bars is an essential design consideration that will be based on the materials present in the inflow. Another consideration is the number of screens present in the system, which will be dependent on the flow characteristics and the type of collection system (Oyler, 2001). While space is an obvious design constraint, it is suggested that at least two screens are used so if one needs maintenance, the inflow still undergoes screening. Depending on the length and slope of the existing collection system, the optimal situation would be to have a system with minimal slope leading to the screens because less turbulence may result

in a higher removal of material (Oyler, 2001). Ultimately, there are four factors to consider when selecting the screen system: particle size and volume of material in inflow, flow variations and influent characteristics, maximum and minimum water levels, and plant hydraulics and allowable headloss (Oyler, 2001).

The grit system selected in the new design must be based on the quantity and characteristics of the grit, space requirements, headloss requirements, removal efficiency (Oyler, 2001). It is important that the grit systems collect the fine grit that can surpass the screen processes, otherwise fine grit can build up and cause problems later in the treatment process. If not already utilized, it would be beneficial to send the removed grit into a cyclone, where it is washed to remove lighter organic material (Oyler, 2001). This washing reduces the odor and allows for easier disposal of grit. Again, it is essential for the grit system design to follow the New Hampshire design requirements (New Hampshire Code of Administrative Rules, 2014). It will also be important to incorporate feedback from the plant operators and observations from the site visit. For instance, if there is visible wear on the equipment, this is evidence that there is strain on the system that must be relieved through upgrades.

3.1.5 Prepare Cost Estimates: Feb 8-12

The team will need to develop a cost estimate for every design option. The estimates will be prepared with cost information from potential vendors. The cost estimates will play an important role in selection of a final recommended design (to take place the following week), as cost is always an important decision factor.

To conduct cost estimates for pump stations, it will be important to remember that the purchase of the pump itself will only account for about 5% of its life cycle costs, whereas 85% result from energy consumption and the remaining 10% of expenses are for regular maintenance (Ackermann, 2003). These percentages can shift, depending on the selection of pumps. Some pumps that have a higher upfront cost are more energy efficient and easier to maintain. This may mean that the initial investment will save the facility money in the future. Other expenses to consider when conducting cost estimates include installation and decommissioning costs in addition to any environmental costs. The team believes it is most beneficial to conduct life-cycle cost analyses, as they consider initial and operating costs. However, it is unclear if calculating these costs will be plausible in the project time-frame.

A closer look at the screens will determine if they need to be replaced or repaired. Additionally if there are only coarse screens or only fine screens, a design addition of either screen will ensure maximum efficiency of the system and prevent rocks and other buildup from entering the system. Installing more expensive or additional screens may be costly upfront but will prolong the life of the entire treatment plant by preventing future maintenance issues.

To evaluate the costs of grit removal, using one grit chamber and a bypass channel for maintenance purposes in each alternative will reduce costs (Olson, 2013). Proper grit removal will lower maintenance costs in the long run and allow for a longer facility lifespan. Lower capital costs can be expected when a forced vortex grit chamber and ancillary equipment are selected (Olson, 2013).

Lastly, a cost estimate will be conducted for renovating or demolishing the abandoned below-grade headworks facility. The facility will likely either be retrofitted to meet system requirements or completely replaced within reasonable time and cost parameters.

3.1.6 Review Design Alternatives: Feb 15-19

Each design alternative will be reviewed to determine the benefits and disadvantages of each with consideration to economic, environmental, constructability, and health and safety constraints. The goal of this period is to select a final recommended design.

To determine a final selection from multiple design alternatives, the team will utilize a decision matrix. The matrix will consider all important constraints and factors and weigh them appropriately by the needs of the client. Scaled points are then assigned to each alternative for each of the criteria. Once the points are weighed and added, the best solution emerges. The team determined a set of important criteria presented in Table 6. The list was developed in partial reference to evaluation criteria used in a similar project for screen technology alternatives (Olson, 2013). The weight of each criterion listed here will be determined with guidance from Stantec, as the importance of each area is dependent on the client.

Table 6. Decision Matrix Criteria and Description

Criteria	Description
Reliability	How consistently the system is expected to perform with a range of flows and operate without operator assistance
Efficiency	How well the system is expected to perform (how much debris may collect at the bottom of holding tanks)
Initial Capital Cost	How much the system costs upfront
O&M Costs (Life Cycle Costs)	How much regular O&M will cost (cleaning, parts replacement, etc.)
Environmental Effects	How friendly the system is to the environment in its manufacture, implementation, and use
Constructability	How efficiently the system uses existing space and how long it will take to implement
Health/Safety	How safe it will be for operators to maintain the system

3.1.7 Finalize Deliverables: Feb 22-Mar 4

After reviewing the potential design alternatives and selecting the best design option, the team will prepare the following three deliverables for Stantec:

1. Set of alternative headworks design plans to improve plant efficiency and capacity
2. Recommended design plan, complete with supportive reasoning in MQP report
3. Presentation of project evolution and conclusions

It is important to note that the MQP report will be updated throughout the term to reflect the work accomplished every week. This report will contain the first two deliverables: the set of alternative design plans and the team's recommended plan. Each design option will have a list of its benefits and disadvantages, in addition to the reasoning for developing the recommended solution. The completed decision matrix will be provided so Stantec can understand the reasoning used in weighing the design options. Finally, the WPI team will present their findings to Stantec in the final week of the project to explain the project process and the information acquired.

Pease Wastewater Treatment Plant Stantec MQP 2016

Period Highlight: 1

Plan

Actual

% Complete

Actual (beyond plan)

% Complete (beyond plan)

**Note: PERIODS and DURATION represent working days (weekends may be used as overflow days)

WPI Students - R. Clark, K. Hedberg, R. Newman



Figure 2. Gantt Chart of Project Schedule

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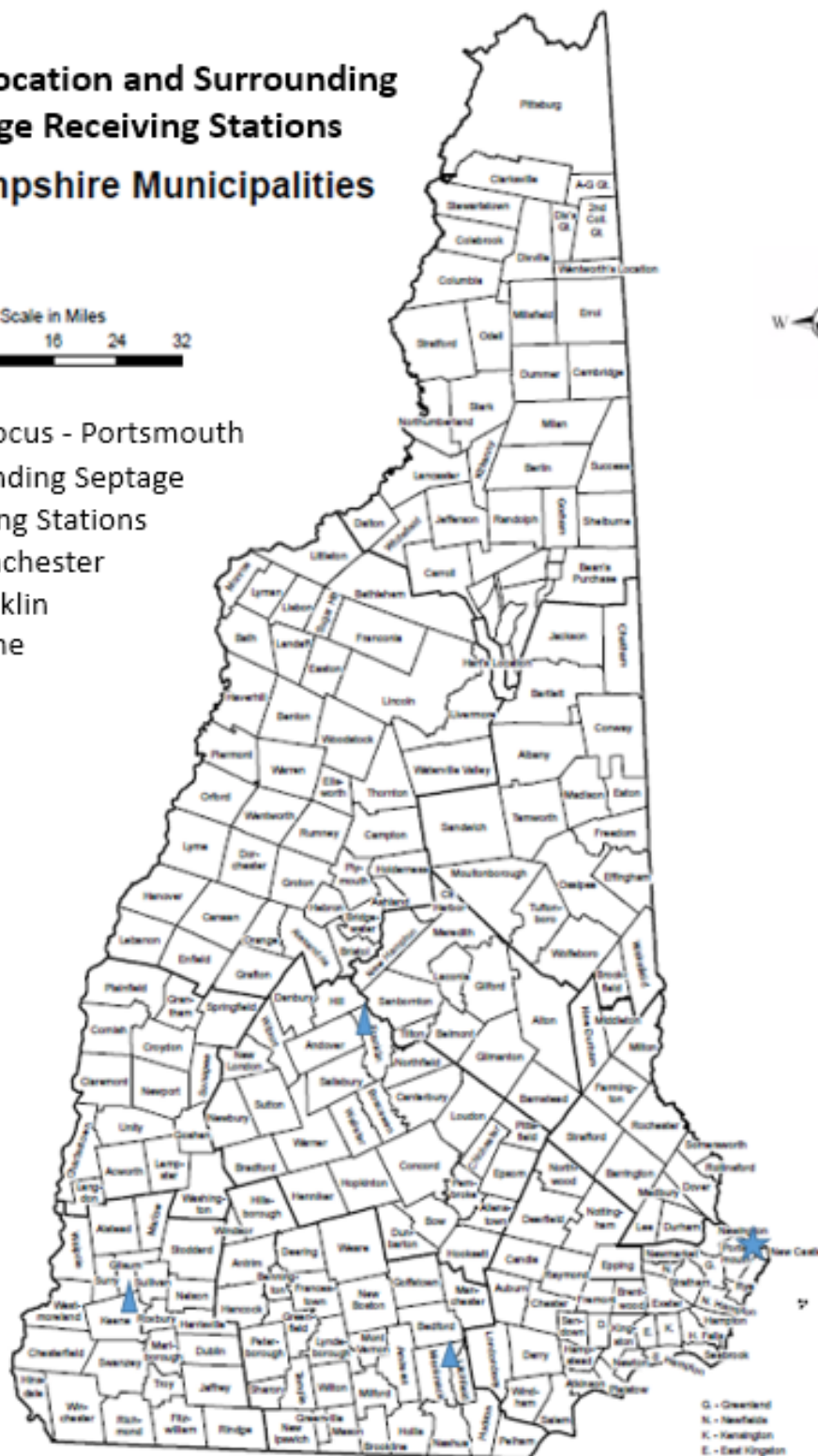
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Appendix B: GIS Map

Project Location and Surrounding Septage Receiving Stations New Hampshire Municipalities

Scale in Miles
0 4 8 16 24 32

- ★ MQP Focus - Portsmouth
- ▲ Surrounding Septage Receiving Stations
Manchester
Franklin
Keene



G - Greenland
N - Newfields
K - Keene
E - East Kingston
D - Derry



Map produced at NH Office of Energy and Planning, November 9, 2004.

Appendix C: Referenced Facility Drawings

2005 Underwood Drawings



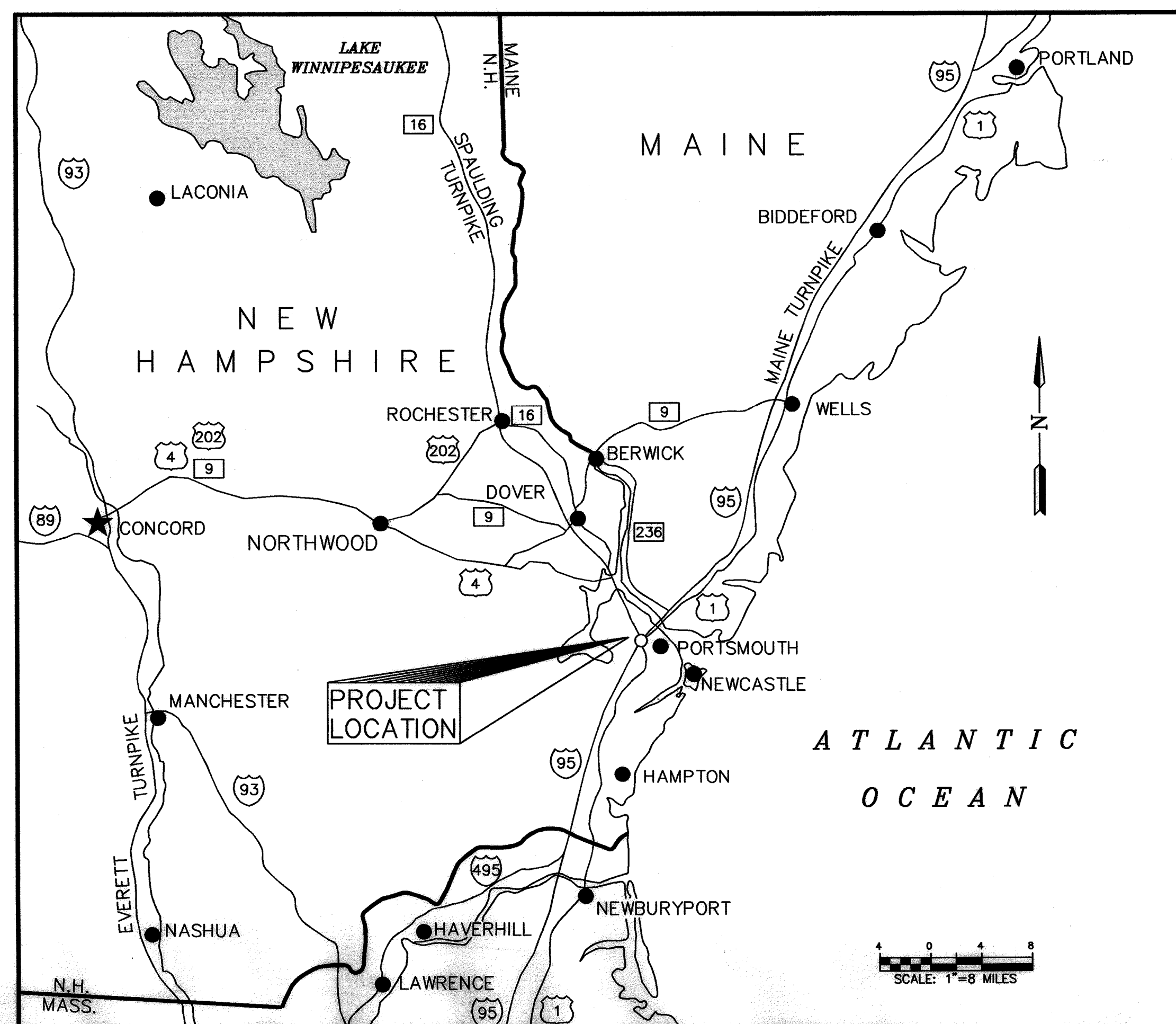
CITY OF PORTSMOUTH, NEW HAMPSHIRE

RECORD DRAWINGS

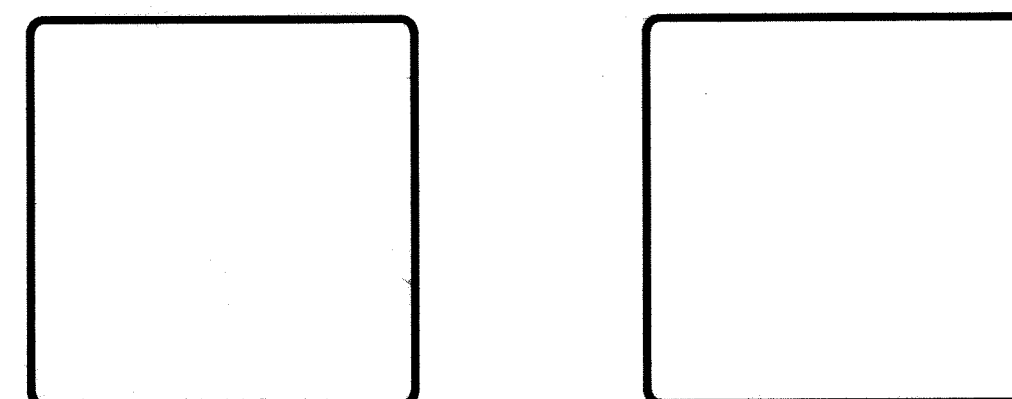
PORTSMOUTH WASTEWATER FACILITIES UPGRADE

PREPARED BY
UNDERWOOD ENGINEERS, INC.
PORTSMOUTH, NEW HAMPSHIRE

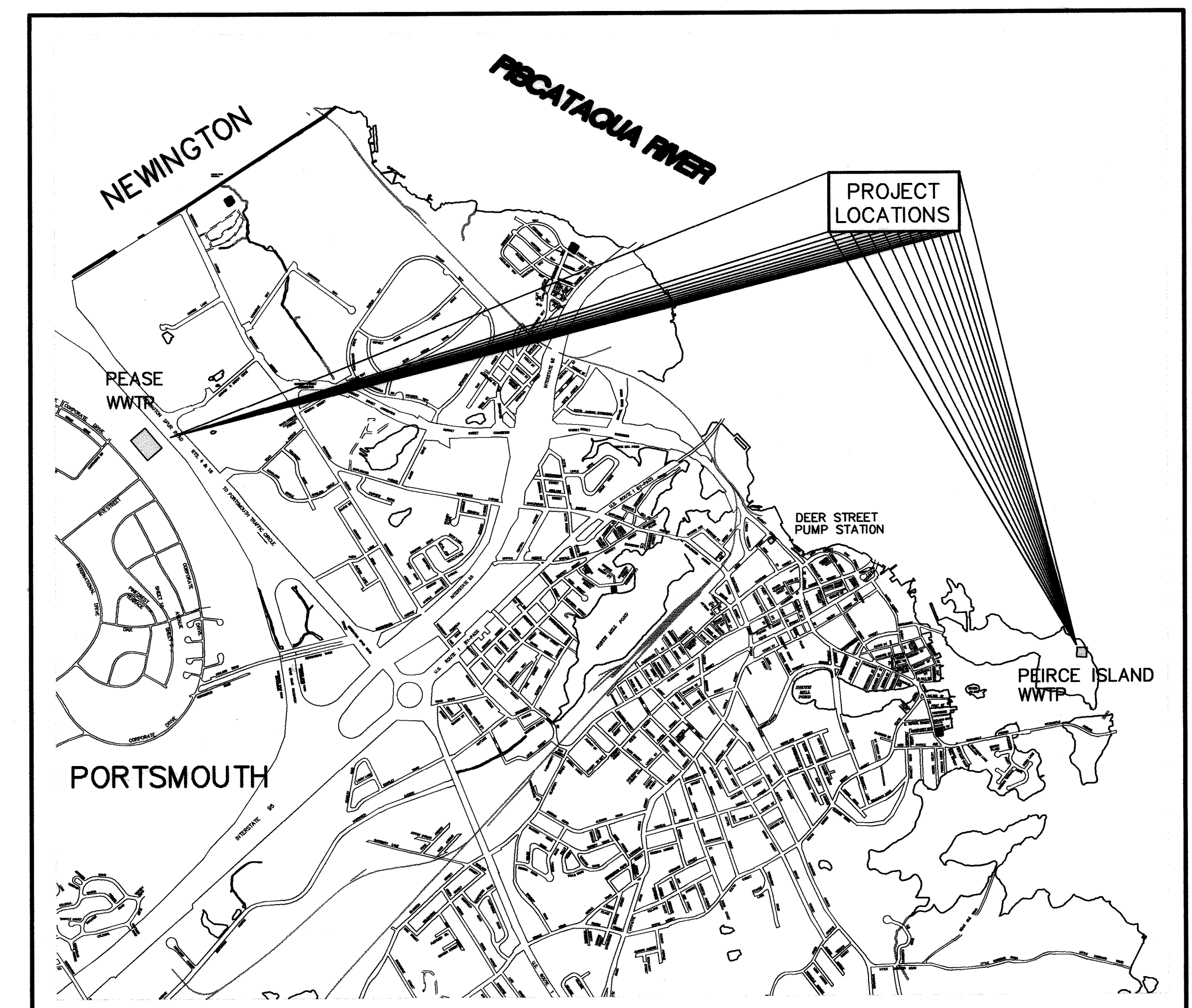
LOCATION PLAN



FEBRUARY 25, 2005
SRF PROJECT NO.
CS-330106-05

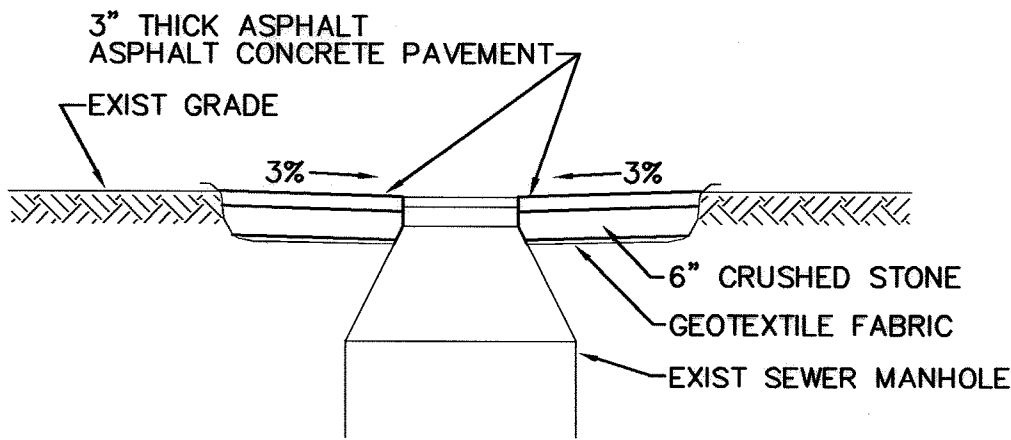


VICINITY MAP

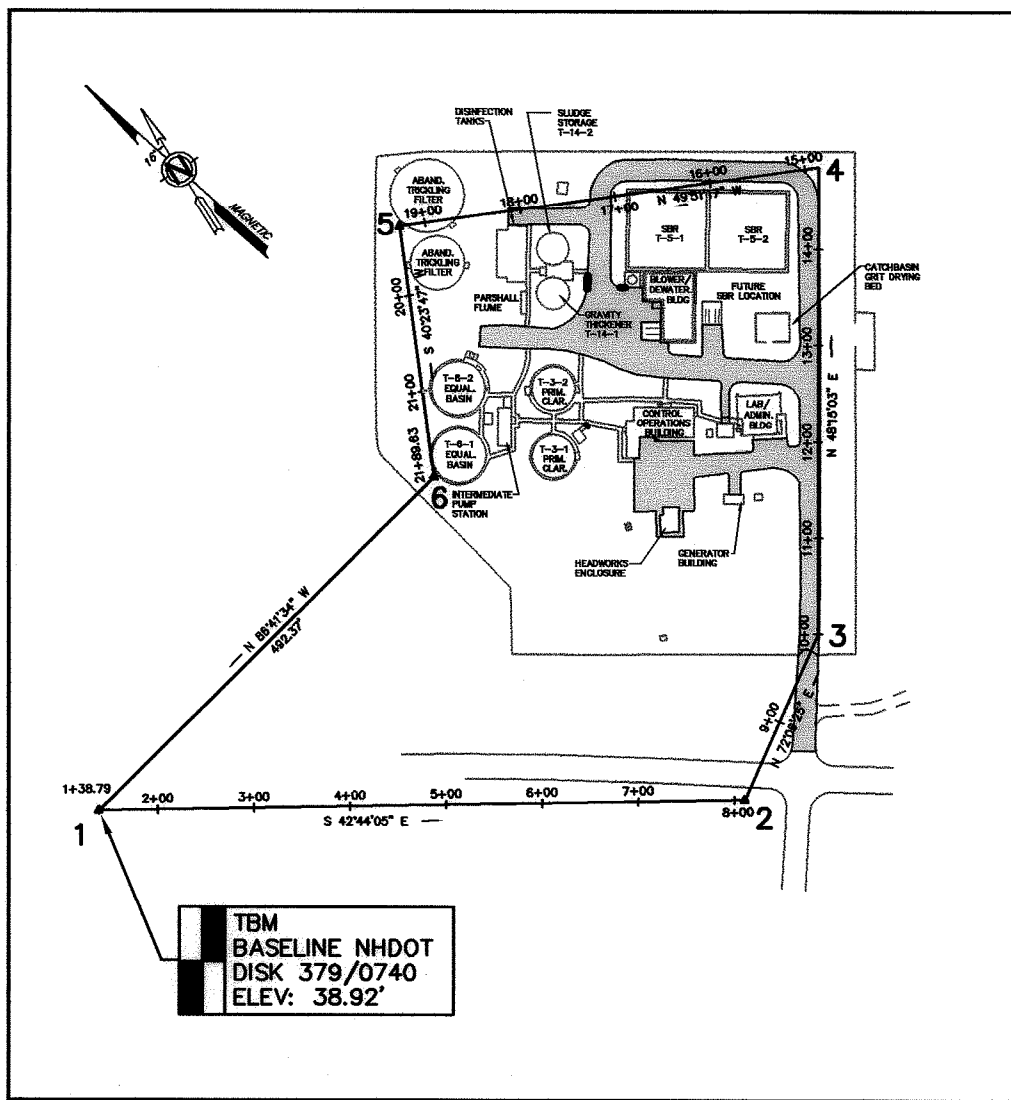


KEYNOTES

- 1 WHITE SPRUCE (PICEA GLAUCA) VARYING HEIGHTS 6' TO 10' (TYP OF 10).
- 2 WHITE PINE (PINUS STROBUS) VARYING HEIGHTS 8'-10'.
- 3 BURNING BUSH (EUONYMUS ALATUS COMPACTA) 3'-4' HIGH (TYP OF 6).
- 4 JUNIPER (ANDORA COMPACTA) 12" HIGH (TYP OF 10).
- 5 MULCH PLANTING BED WITH STEEL EDGING AND WEED FABRIC.
- 6 SIGN, TO SEPTAGE RECEIVING , TO BE APPROVED BY ENGINEER.
- 7 SIGN, "ONE WAY, DO NOT ENTER", MEETING MUTCD REQUIREMENTS.
- 8 RELOCATE EXISTING TREES.
- 9 4" THICK ASPHALT CONCRETE PAVEMENT.
- 10 15' x 25' x 3" THICK ASPHALT CONCRETE PAVEMENT CONTAINMENT AREA. (TEMPORARY)
- 11 12" THICK CRUSHED GRAVEL DRIVE ON GEOTEXTILE FABRIC. (TEMPORARY)
- 12 6" THICK CRUSHED STONE (1-1/2" MINUS) ON WEED CONTROL GEOTEXTILE FABRIC, SAMPLE OF STONE TO BE APPROVED BY ENGINEER.



1 TEMPORARY CONTAINMENT AREA
C-3 NOT TO SCALE



SURVEY CONTROL PLAN

SCALE: 1 INCH = 200 FT.

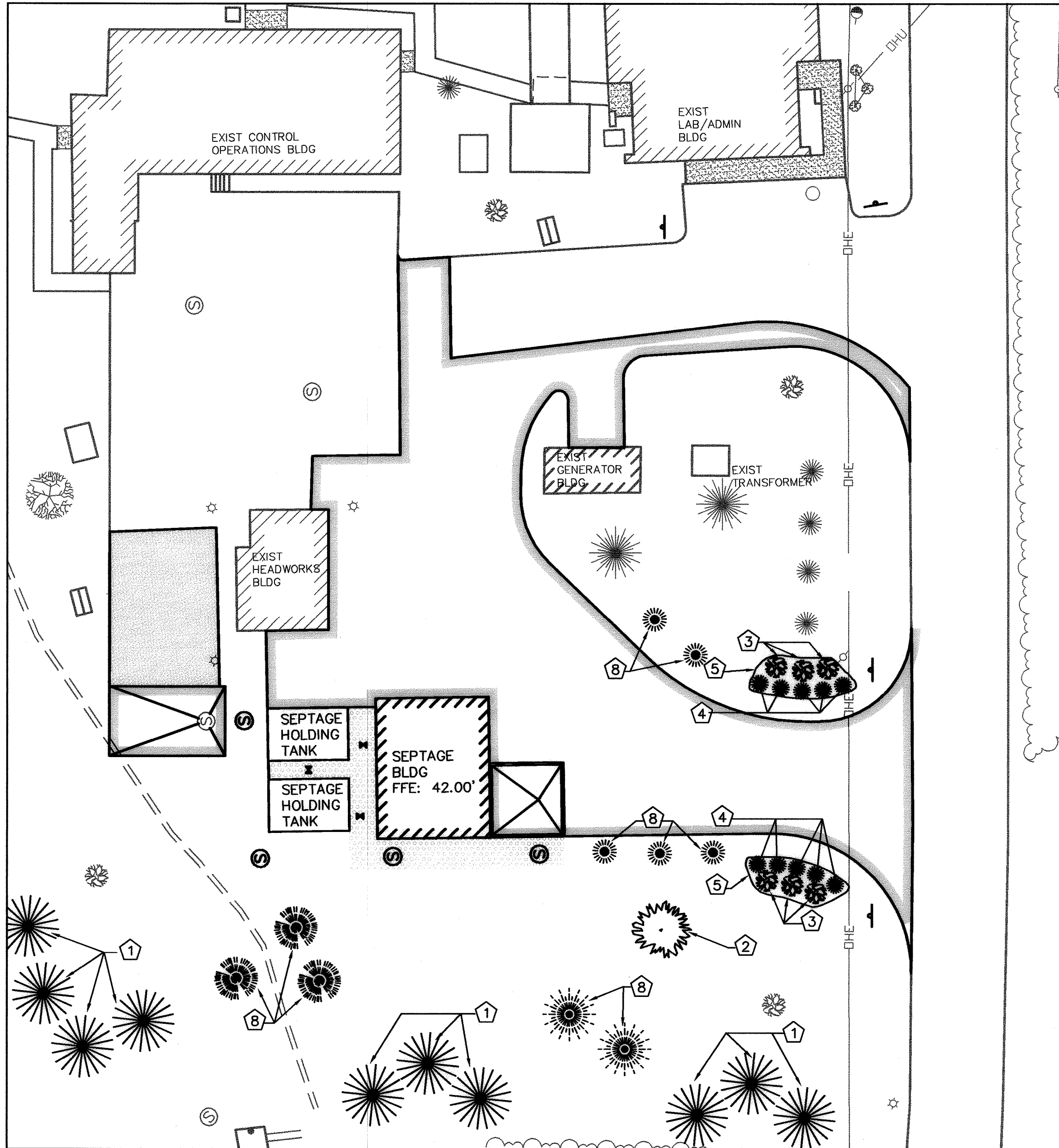
NOTES:

1. TEMPORARY PAVED CONTAINMENT AREA AND CRUSHED GRAVEL ARE TO BE MAINTAINED IN GOOD USEABLE CONDITION BY CONTRACTOR DURING CONSTRUCTION. THESE AREAS ARE TO BE ACCESSIBLE TO SEPTIC TRUCKS AT ALL TIMES.
2. TEMPORARY PAVED CONTAINMENT AREA AND CRUSHED GRAVEL TO BE REMOVED BY CONTRACTOR AT NO ADDITIONAL COST TO OWNER, ONCE NEW SEPTAGE RECEIVING STATION IS IN OPERATION. AREAS UNDERNEATH ARE TO BE RESTORED WITH 6" THICK TOPSOIL, SEED AND MULCH.

HORIZONTAL/VERTICAL CONTROL POINTS

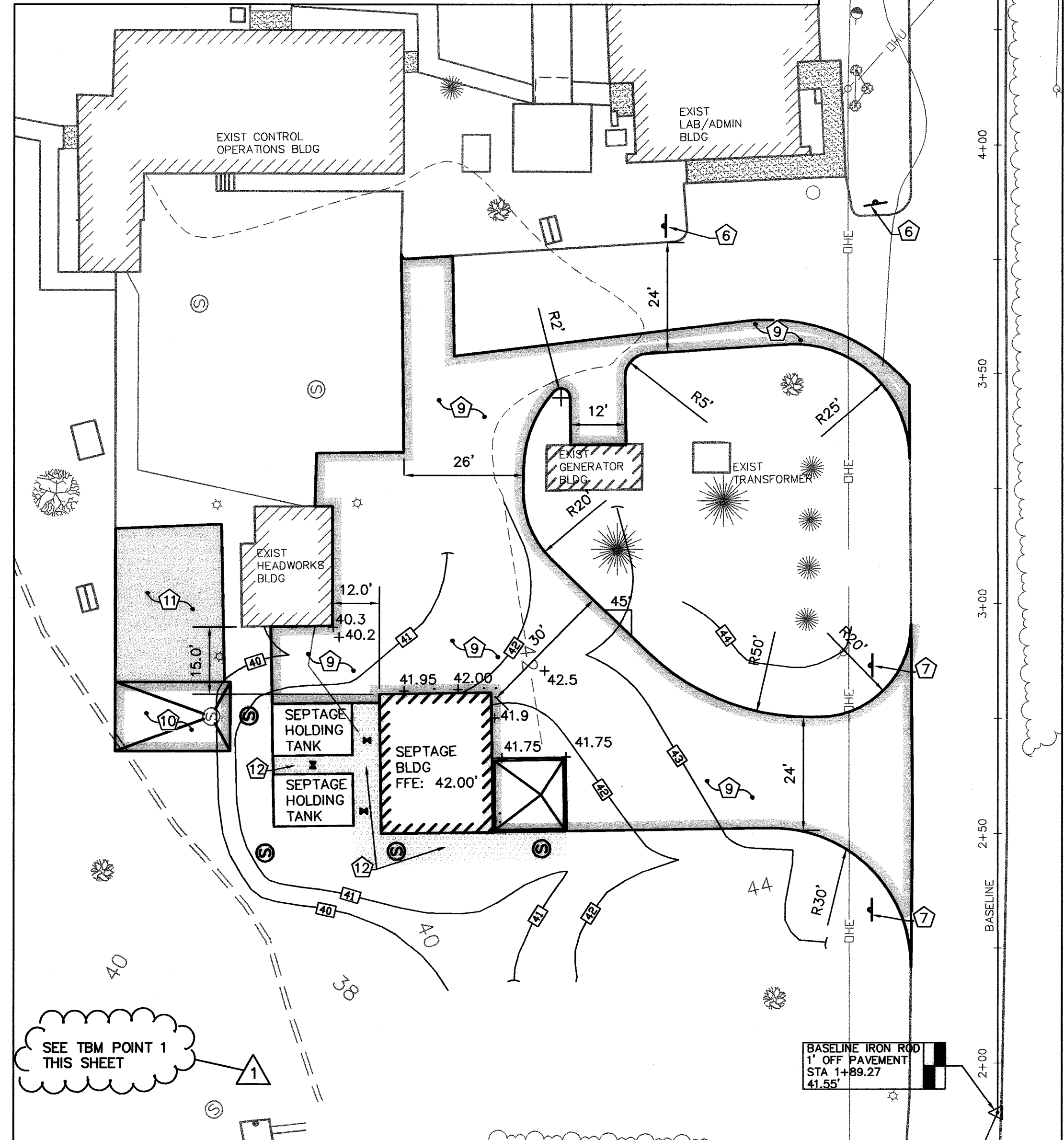
STA	#	STATION	NORTHING	EASTING	ELEV	DESCRIPTION
1		1+38.79	214031.93	1216113.87	38.92	NHDOT SURVEY DISK IN BOX CULVERT 379/0740
2		8+10.74	213538.37	1216569.87	38.63	NHDOT SURVEY DISK 379/0750
3		10+00	213596.53	1216749.96	41.55	IRON ROD FLUSH TO GROUND, 1 FT FROM EDGE OF PAVEMENT
4		14+86.06	213920.19	1217112.61	43.75	IRON ROD FLUSH TO GROUND 14 FT FROM EDGE OF PAVEMENT
5		19+26.32	214204.03	1216776.07	52.43	IRON ROD FLUSH TO GROUND NORTHWEST SIDE OF TRICKLING FILTER
6		21+89.63	214003.51	1216605.42	42.36	IRON ROD FLUSH TO GROUND NORTHWEST SIDE OF SECONDARY CLARIFIER

NOTE: THE CONTROL POINTS SHOWN ARE THOSE ESTABLISHED FOR CONSTRUCTION
SEE U.E. FIELD BOOK #125.



LANDSCAPING PLAN

SCALE: 1 INCH = 20 FT.



GRADING PLAN

SCALE: 1 INCH = 20 FT.

RECORD DRAWING

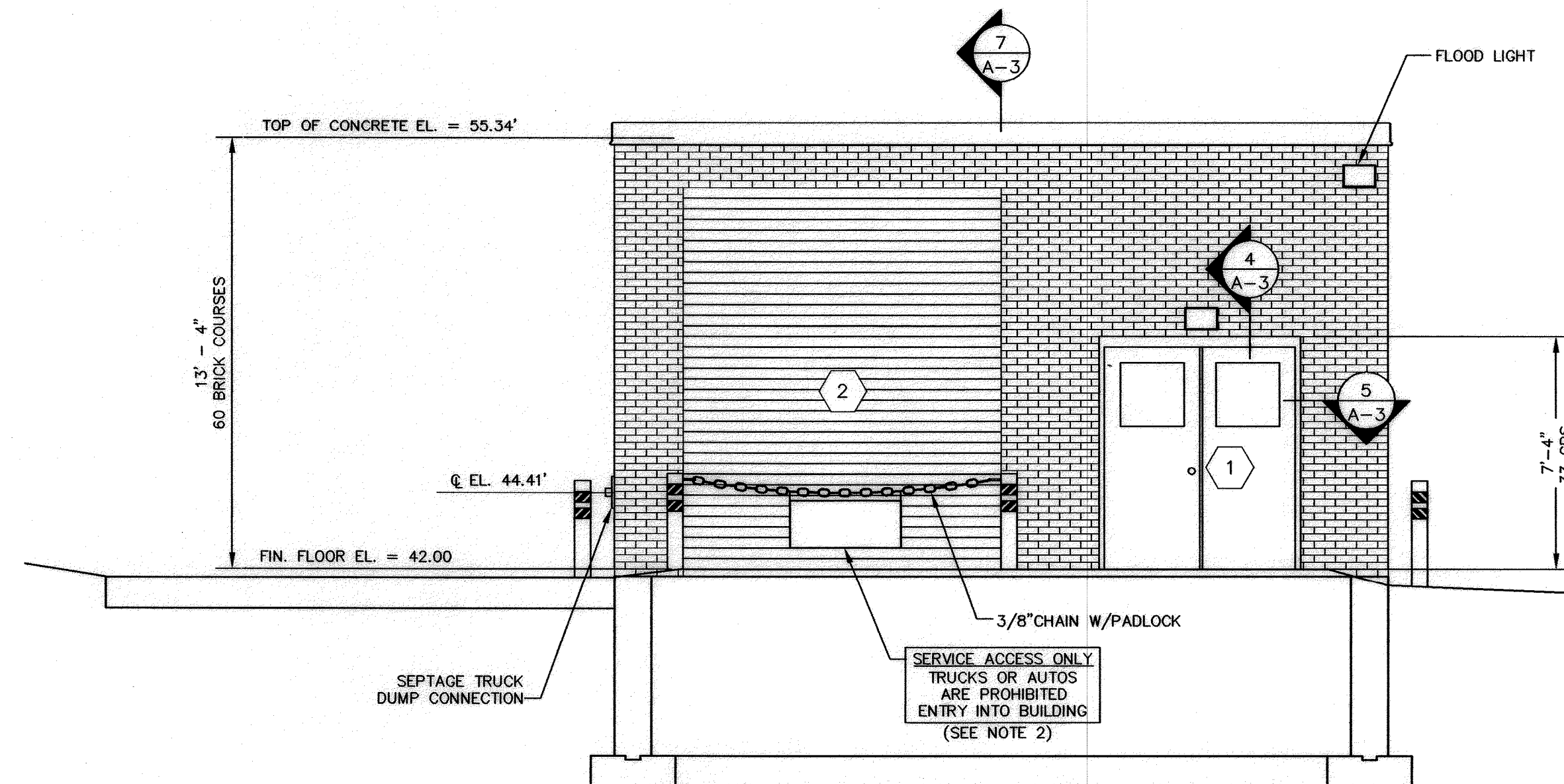
Underwood
Engineers, Inc.

25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

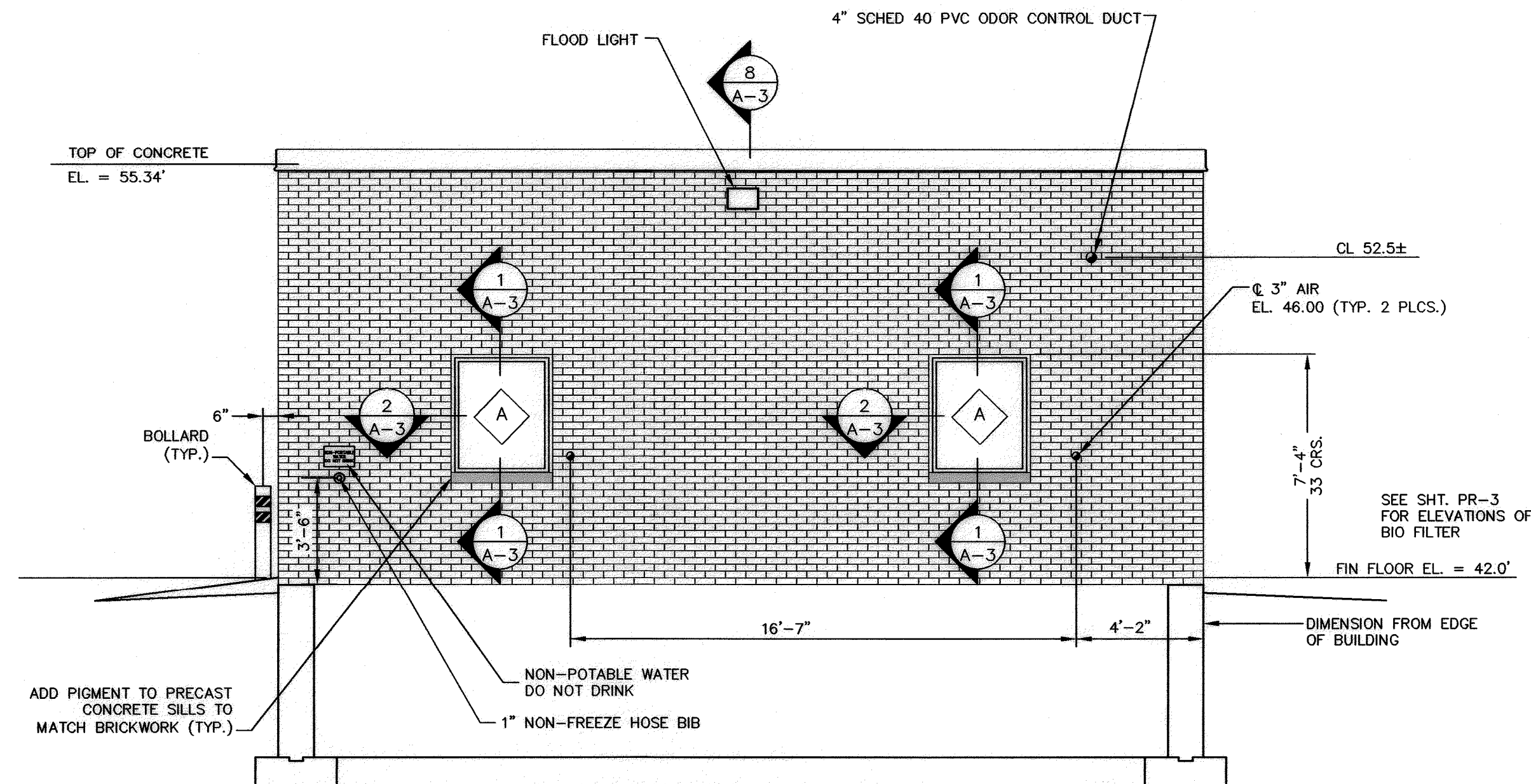
PEASE TREATMENT PLANT
LANDSCAPING & GRADING PLAN
WASTEWATER FACILITIES UPGRADE

CITY OF PORTSMOUTH
PORTSMOUTH, N.H.

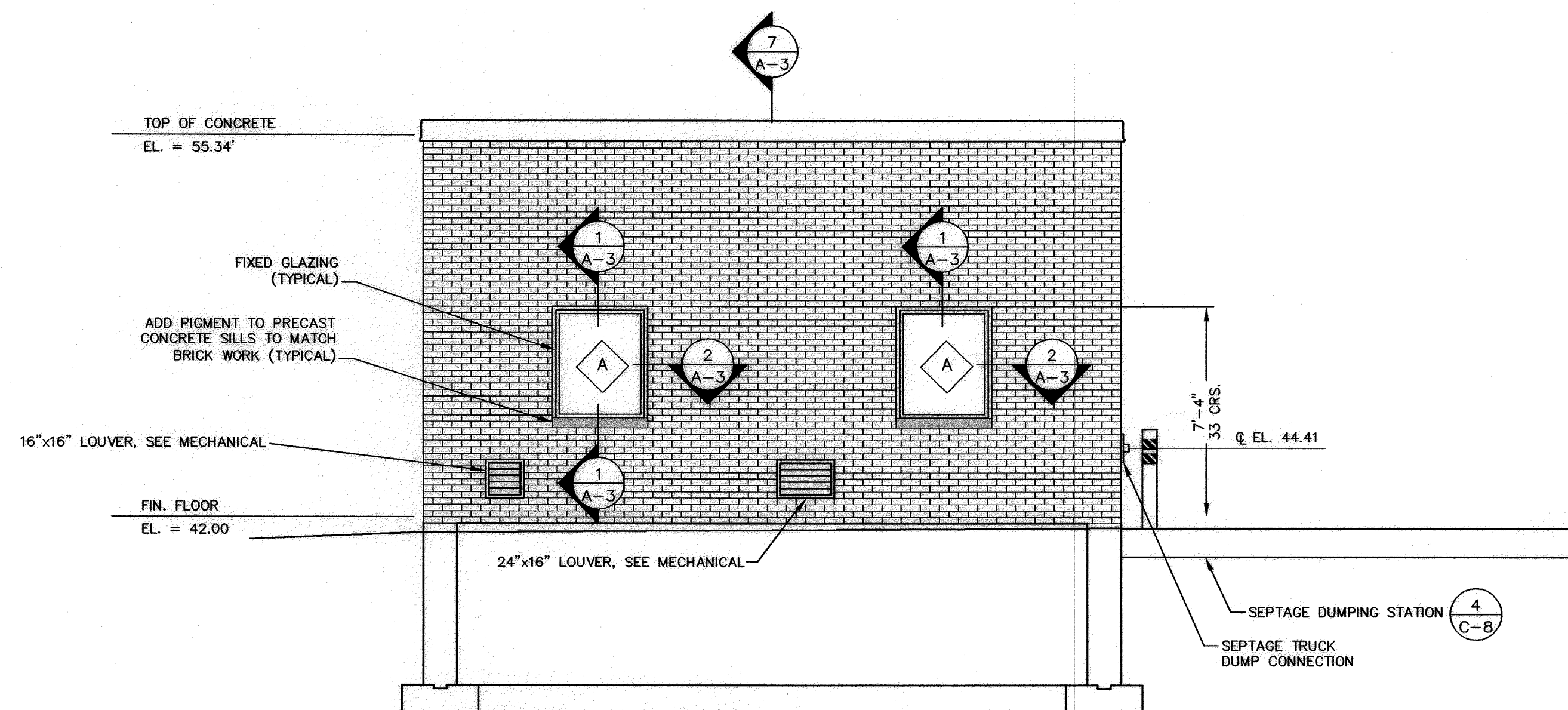
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C-3
SHEET
4 OF 71



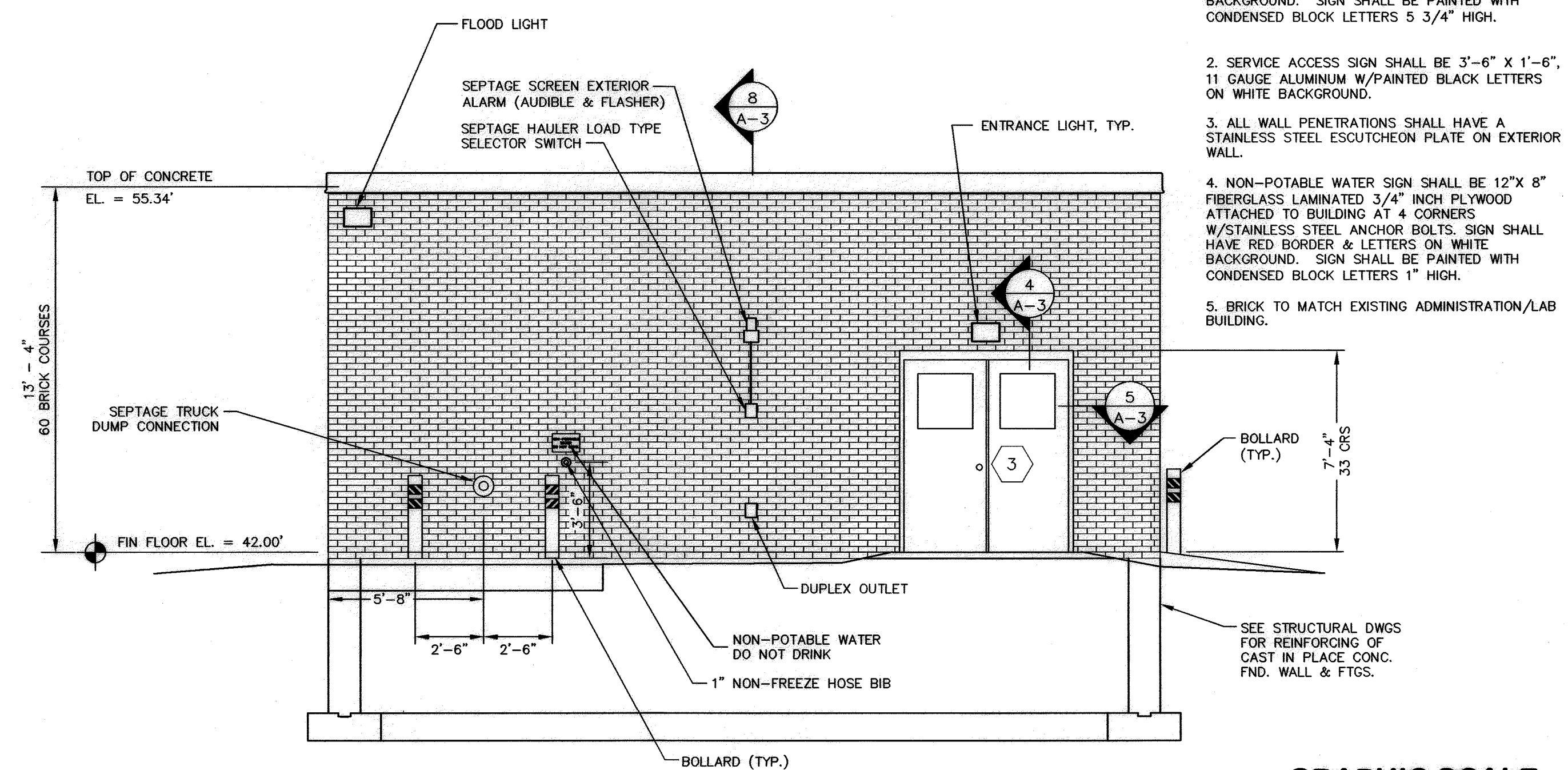
NORTH ELEVATION
SCALE: 1/4"=1'-0"



WEST ELEVATION
SCALE: 1/4"=1'-0"




SOUTH ELEVATION
SCALE: 1/4"=1'-0"



EAST ELEVATION
SCALE: 1/4"=1'-0"

GRAPHIC SCALE



SCALE: 1 INCH = 4 FT.

RECORD DRAWING

[illegible]

**Underwood
Engineers, Inc.**
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

PEASE SEPTAGE BUILDING ELEVATION

WASTEWATER FACILITIES UPGRADE

CITY OF PORTSMOUTH
PORTSMOUTH, N.H.

DWG NO A-1	SHEET 12 OF 71
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NOTES:

1. SEE STRUCTURAL SHEETS FOR ADDITIONAL DETAIL.
2. SEE MECHANICAL FOR ROOF FAN AND VENT LOCATIONS.

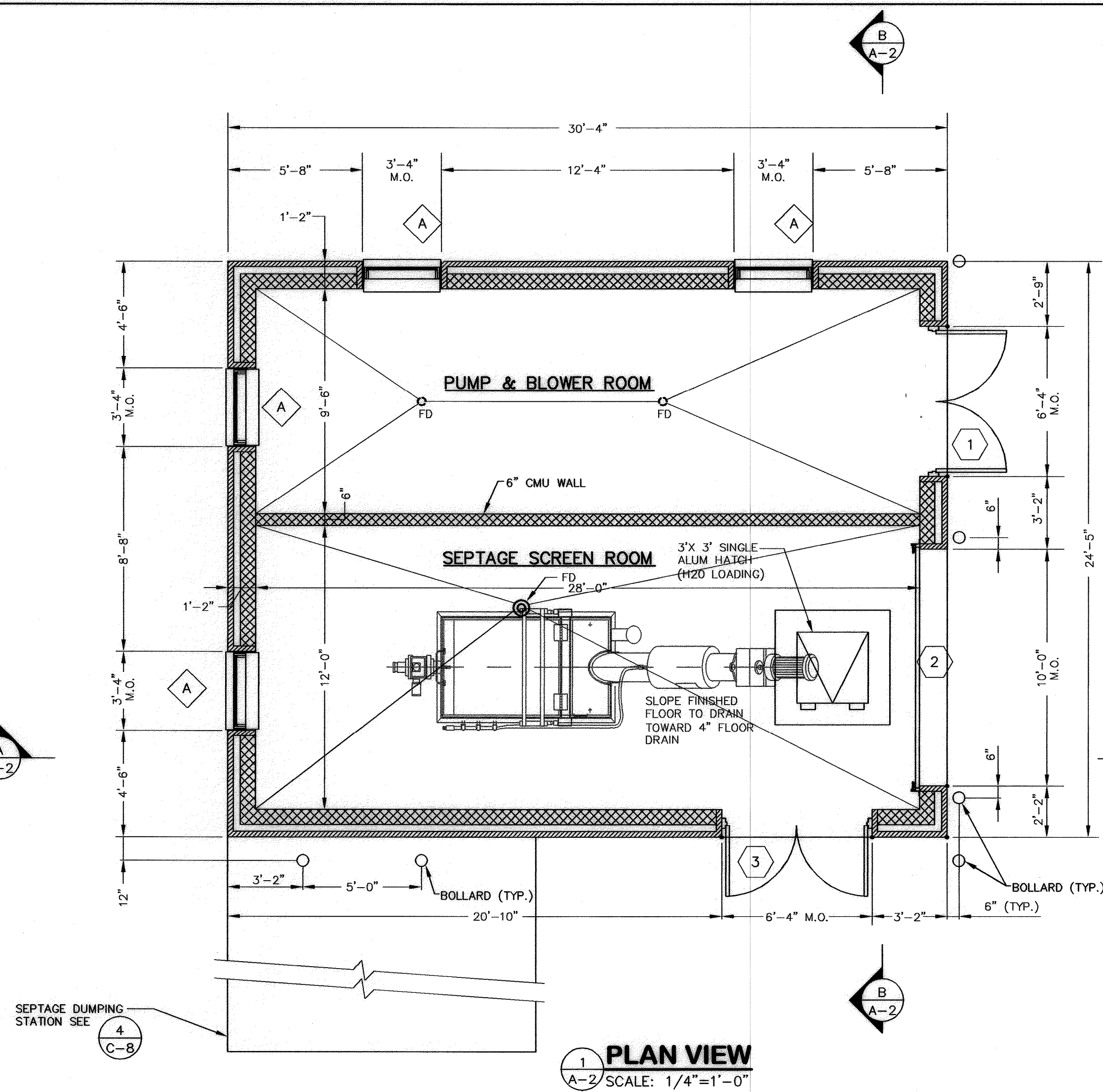
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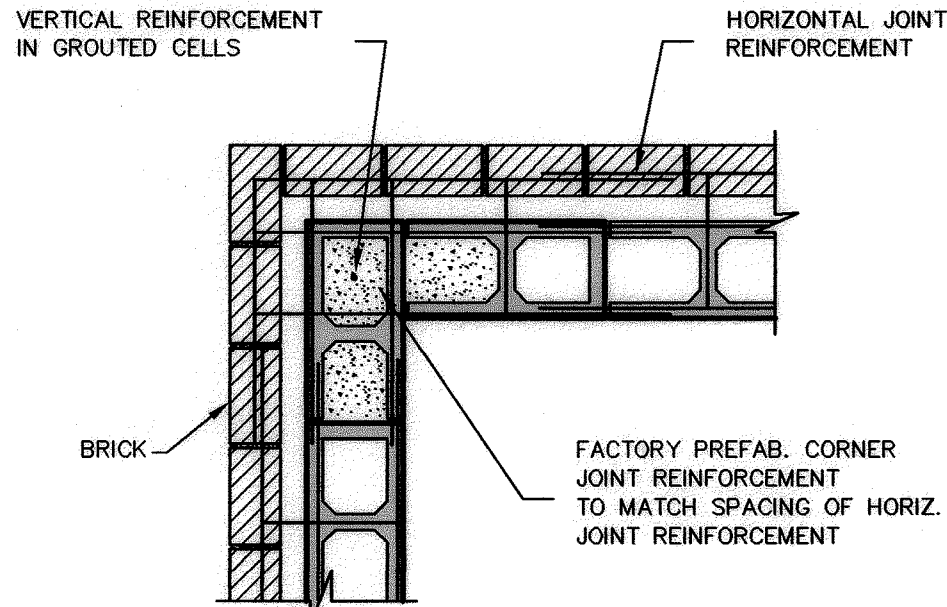
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25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

PEASE SEPTAGE BUILDING DETAILS
WASTEWATER FACILITIES UPGRADE
CITY OF PORTSMOUTH
PORTSMOUTH, N.H.

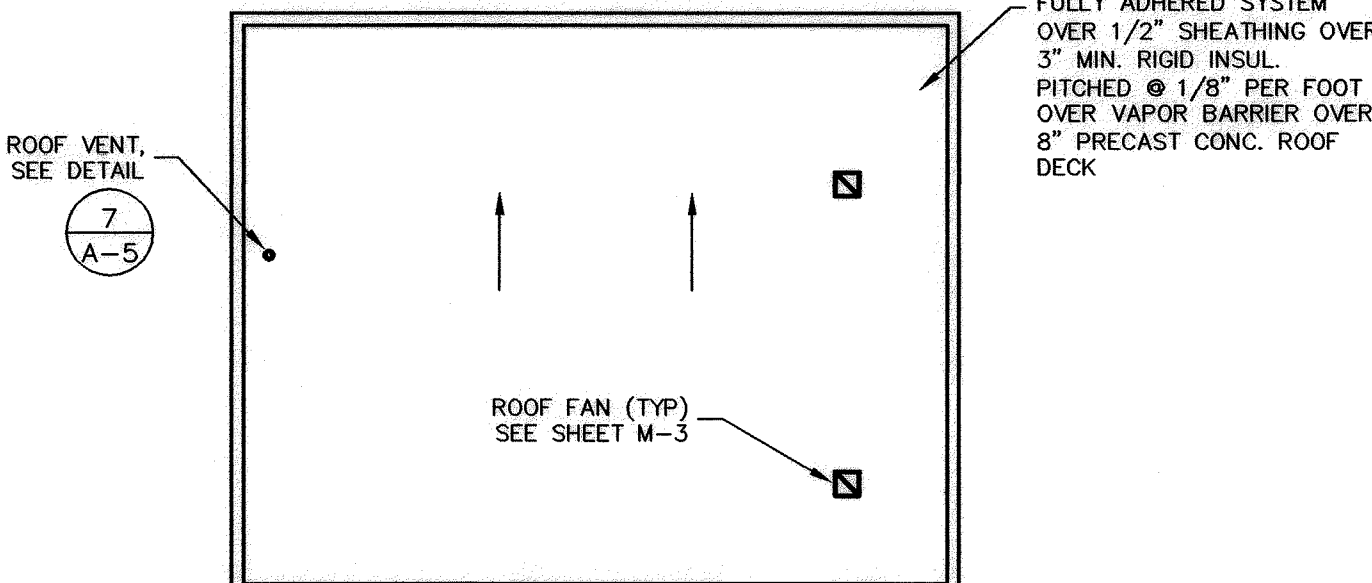
DWG NO. A-2
SHEET 13 OF 71



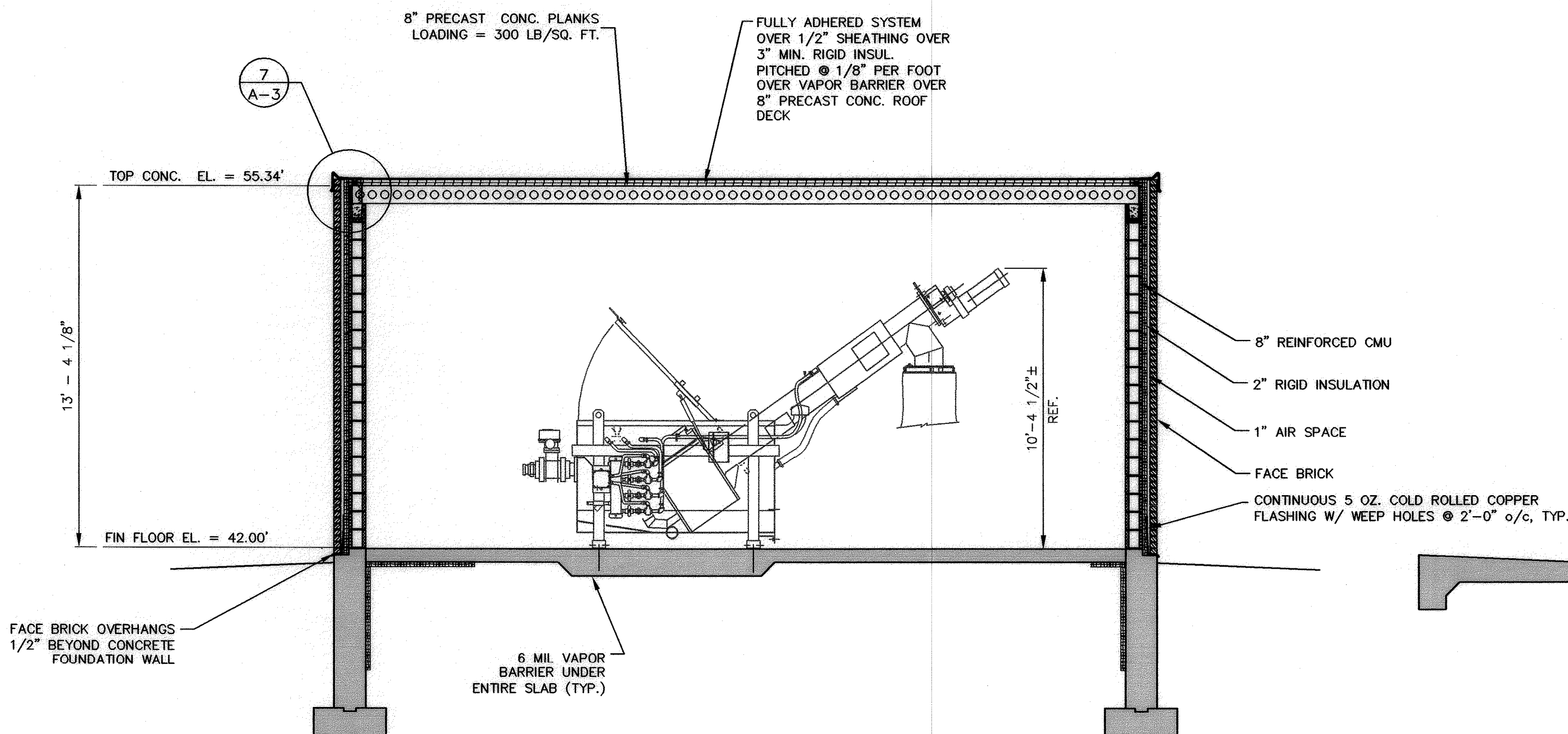
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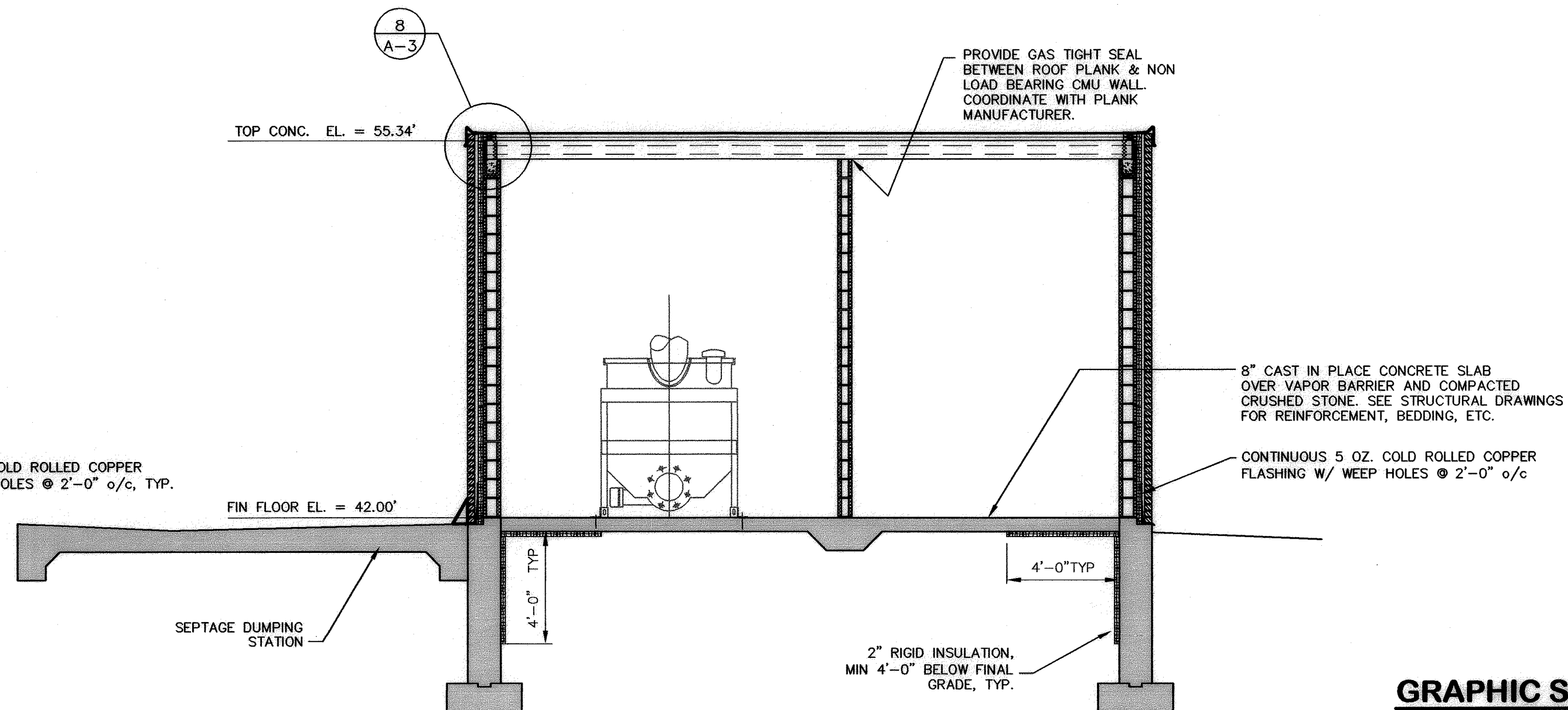
CORNER JOINT REINFORCEMENT



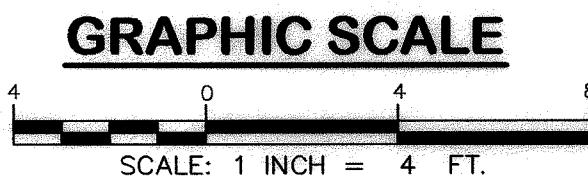
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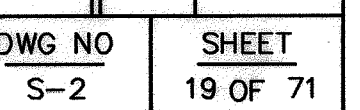
A SECTION
SCALE: 1/4"=1'-0"

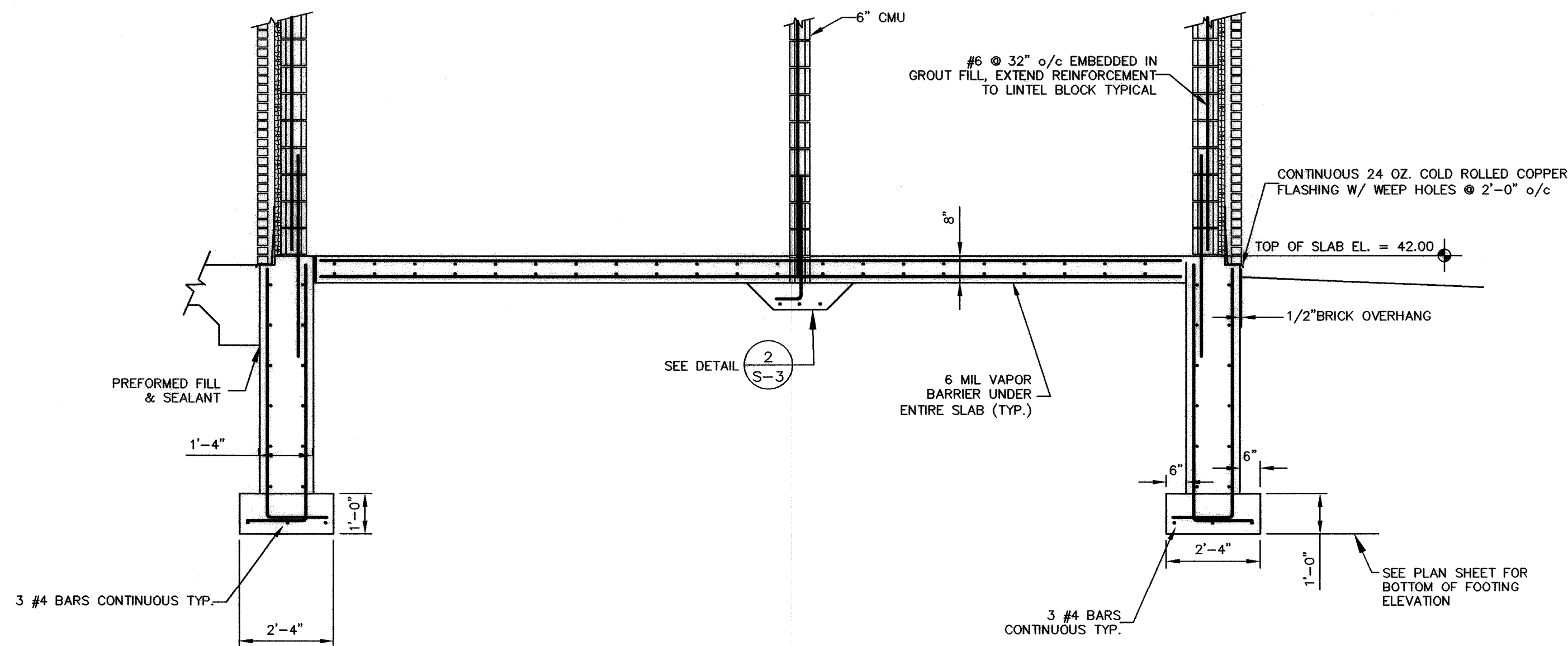


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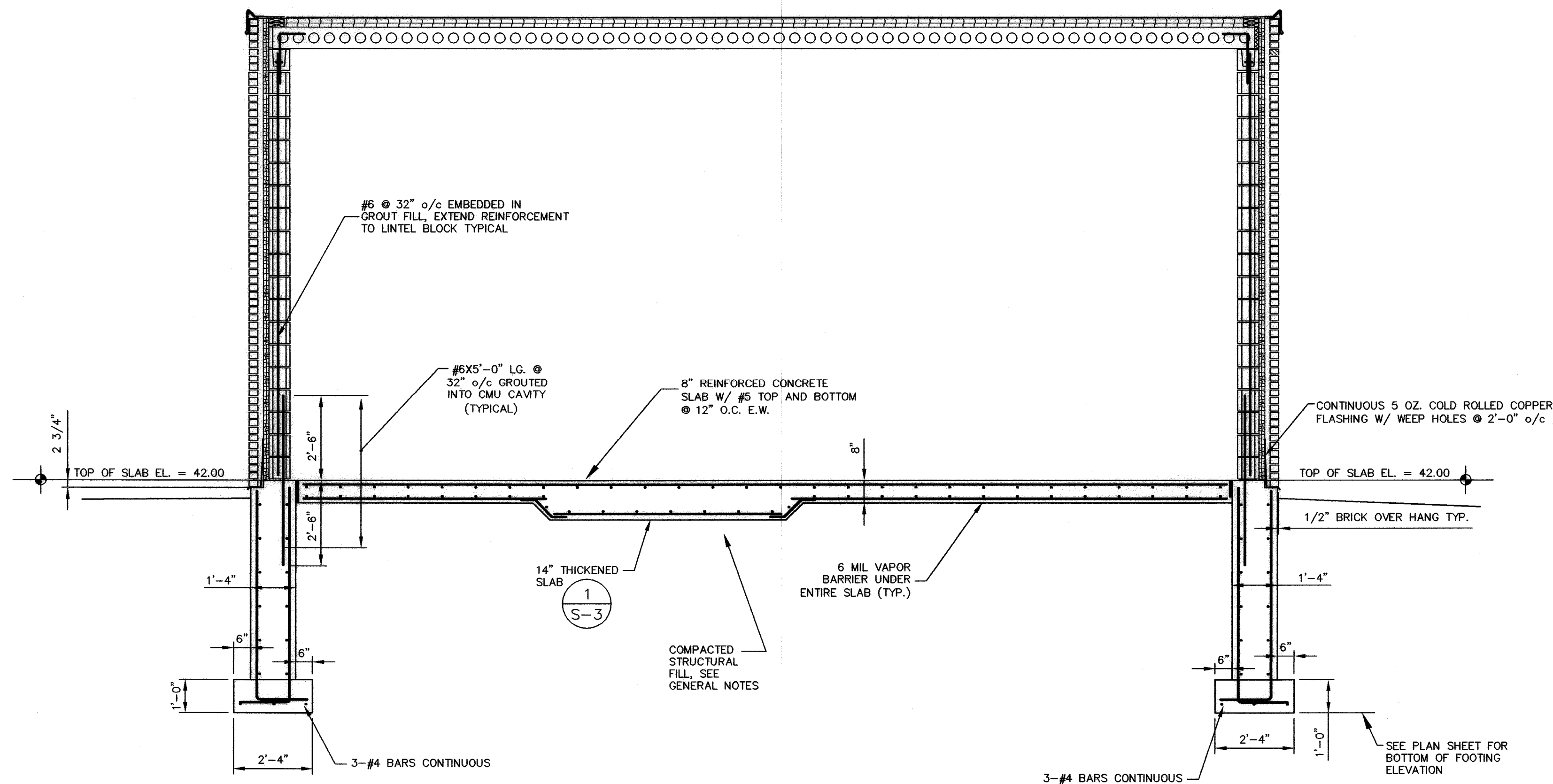


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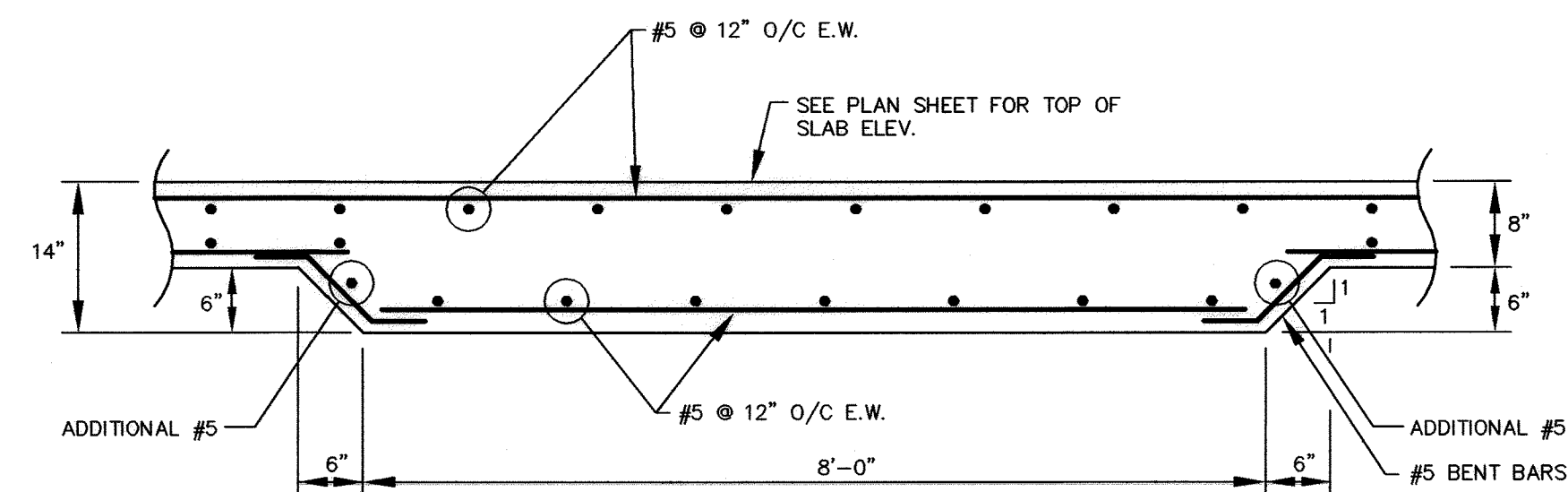




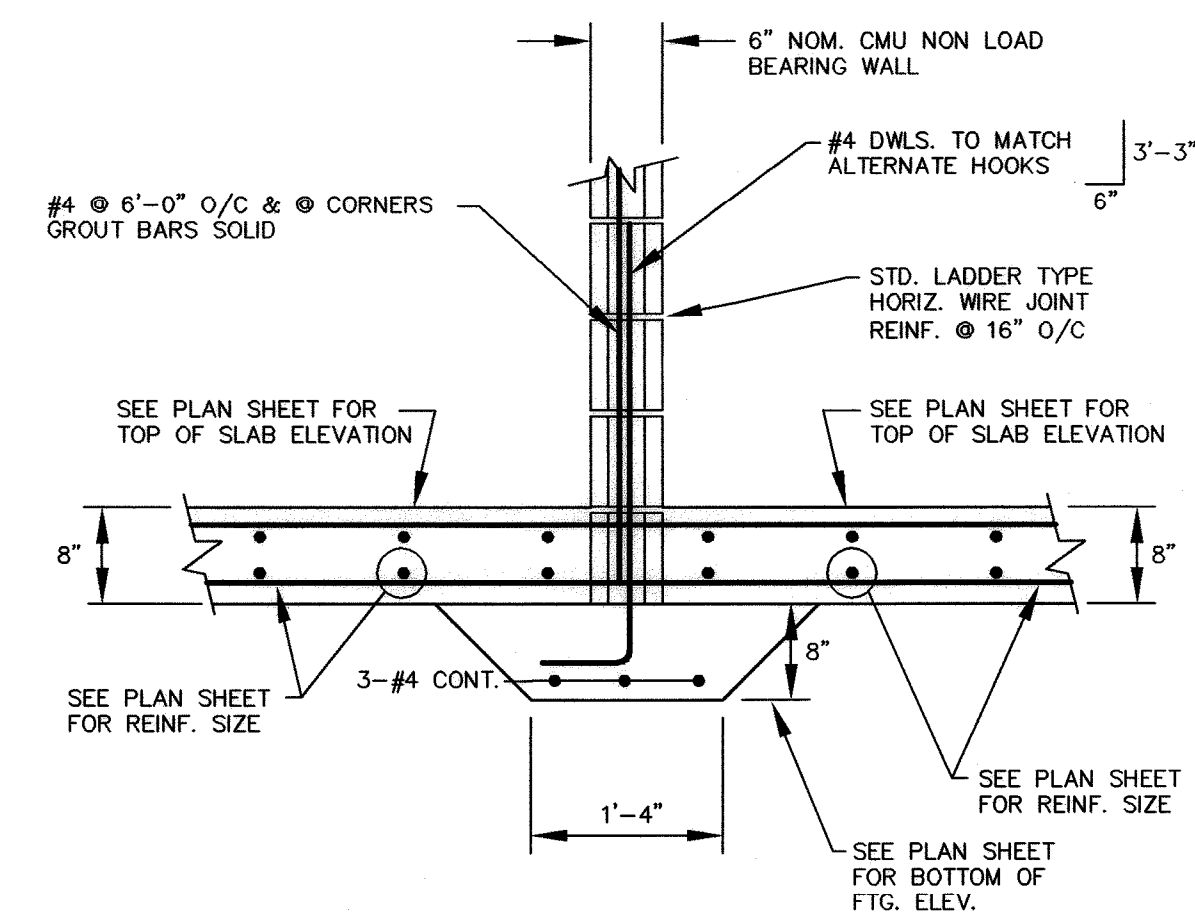
A SECTION A-A
SCALE: 3/8" = 1'-0"



B SECTION B-B
SCALE: 3/8" = 1'-0"



1 THICKENED SLAB DETAIL
SCALE: 3/4" = 1'-0"



2 6" CMU WALL DETAIL
SCALE: 3/4" = 1'-0"

NOTES:

- ALL REINFORCEMENT BAR TO "ON CENTER" (O.C.)
- SEE ARCHITECTURAL DRAWINGS A-2 AND A-3 FOR ADDITIONAL DETAILS.

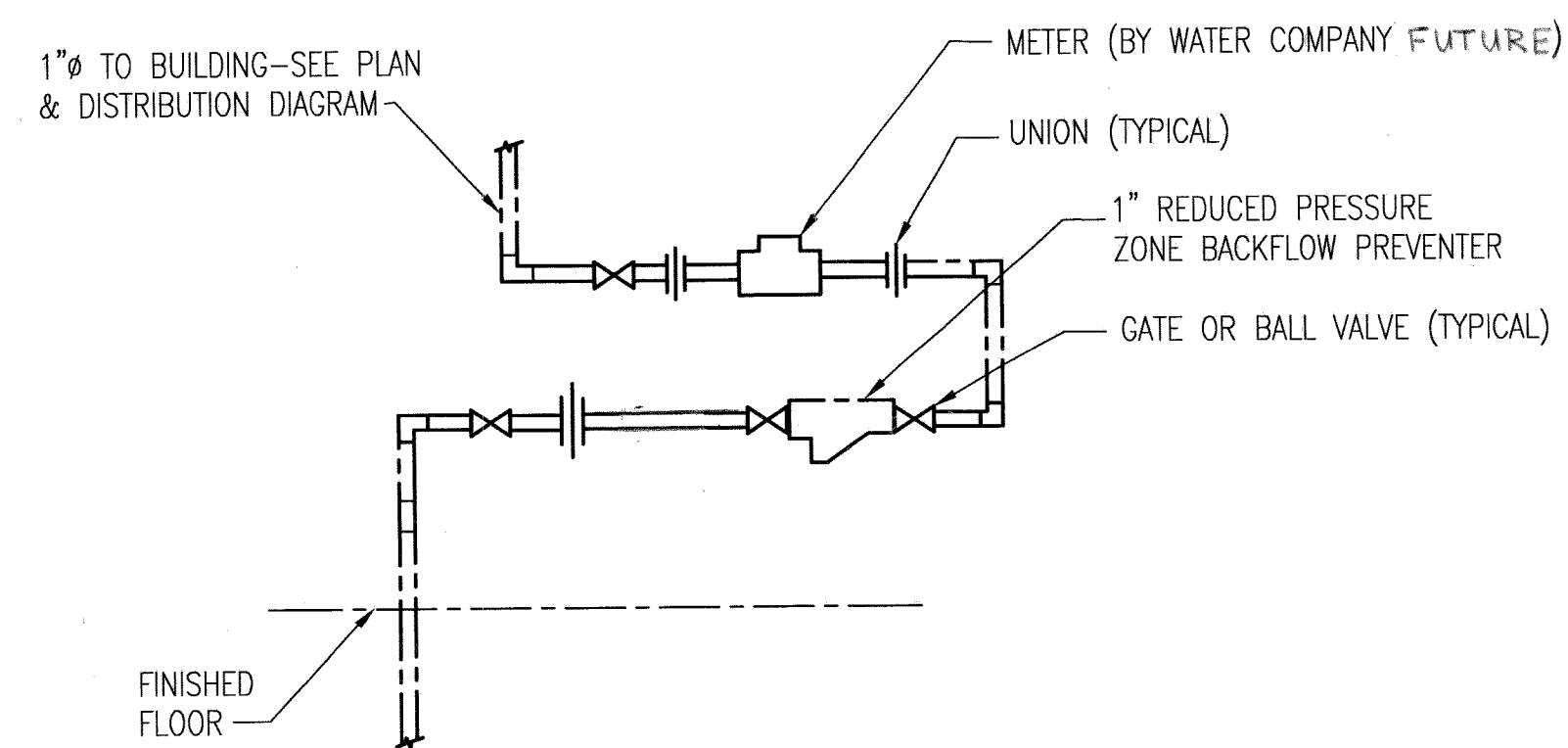
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ISSUE FOR		APPROVAL		REVISIONS		APPROVAL	
DATE	BY	DATE	BY	NO.	DESCRIPTION	DATE	BY
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2/19/02	NSC	2/19/02	NSC				
2/25/05	NSC	2/25/05	NSC				
DRAWN		DESIGNED		CHECKED		APPROVED	
MAG		JAH		PHR		NSC	
2/15/02		2/15/02		2/15/02		2/15/02	
BOOK NO.		PROJECT NO.		DWG. ID		AS SHOWN	
348		348		348		348	
SCALE		SCALE		SCALE		SCALE	
AS SHOWN		AS SHOWN		AS SHOWN		AS SHOWN	

Underwood Engineers, Inc.
25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

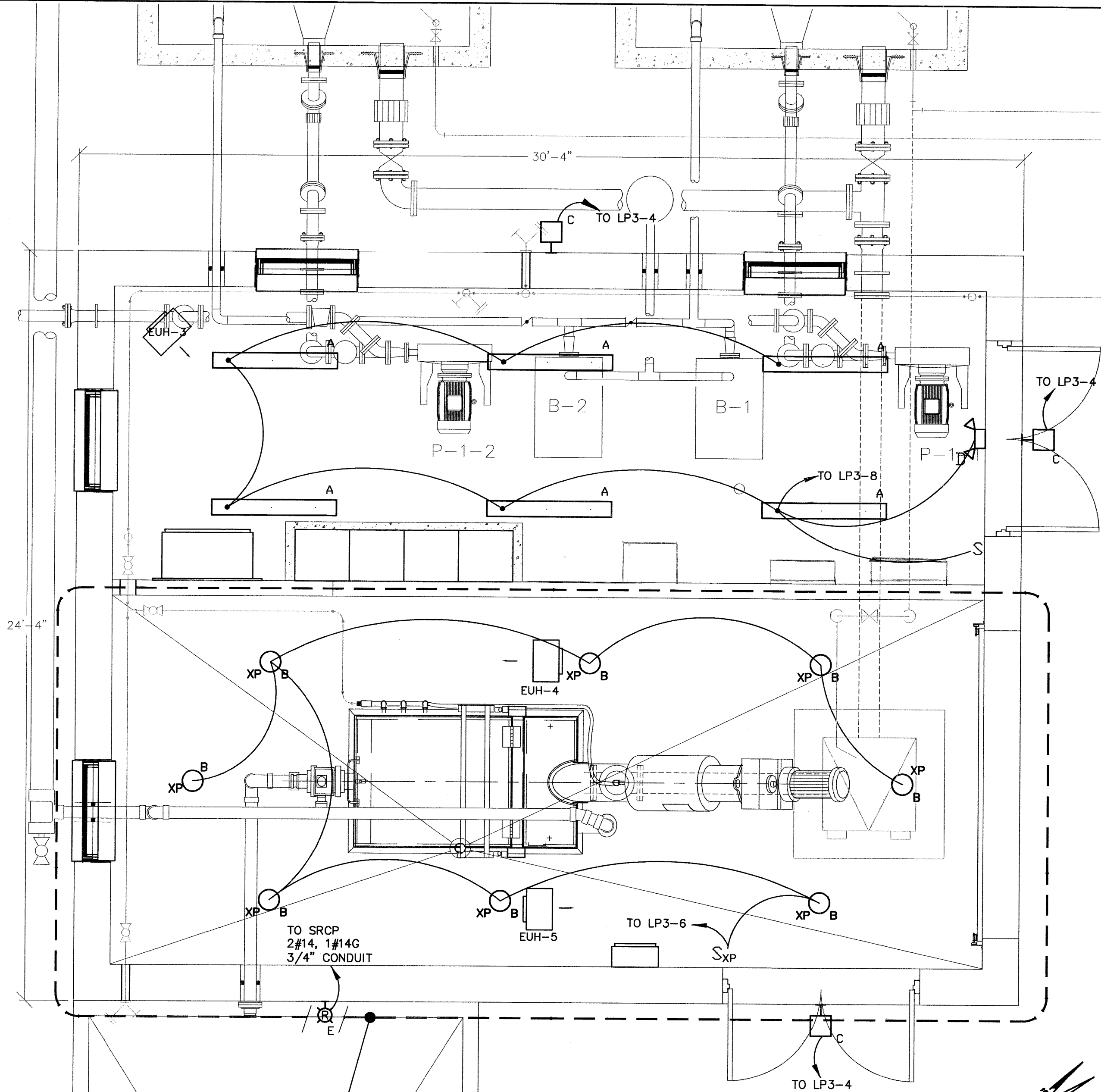
PEASE SEPTAGE BUILDING
SECTIONS & DETAILS
WASTEWATER FACILITIES UPGRADE
CITY OF PORTSMOUTH
PORTSMOUTH, N.H.

DWG NO
S-3
SHEET
20 OF 71



E9-SP-LP.dwg 3-6-02 1:29:36 pm EST

2/24/02



PEASE WWTF SEPTAGE RECEIVING BUILDING LIGHTING PLAN
SCALE: 3/8"=1'-0"

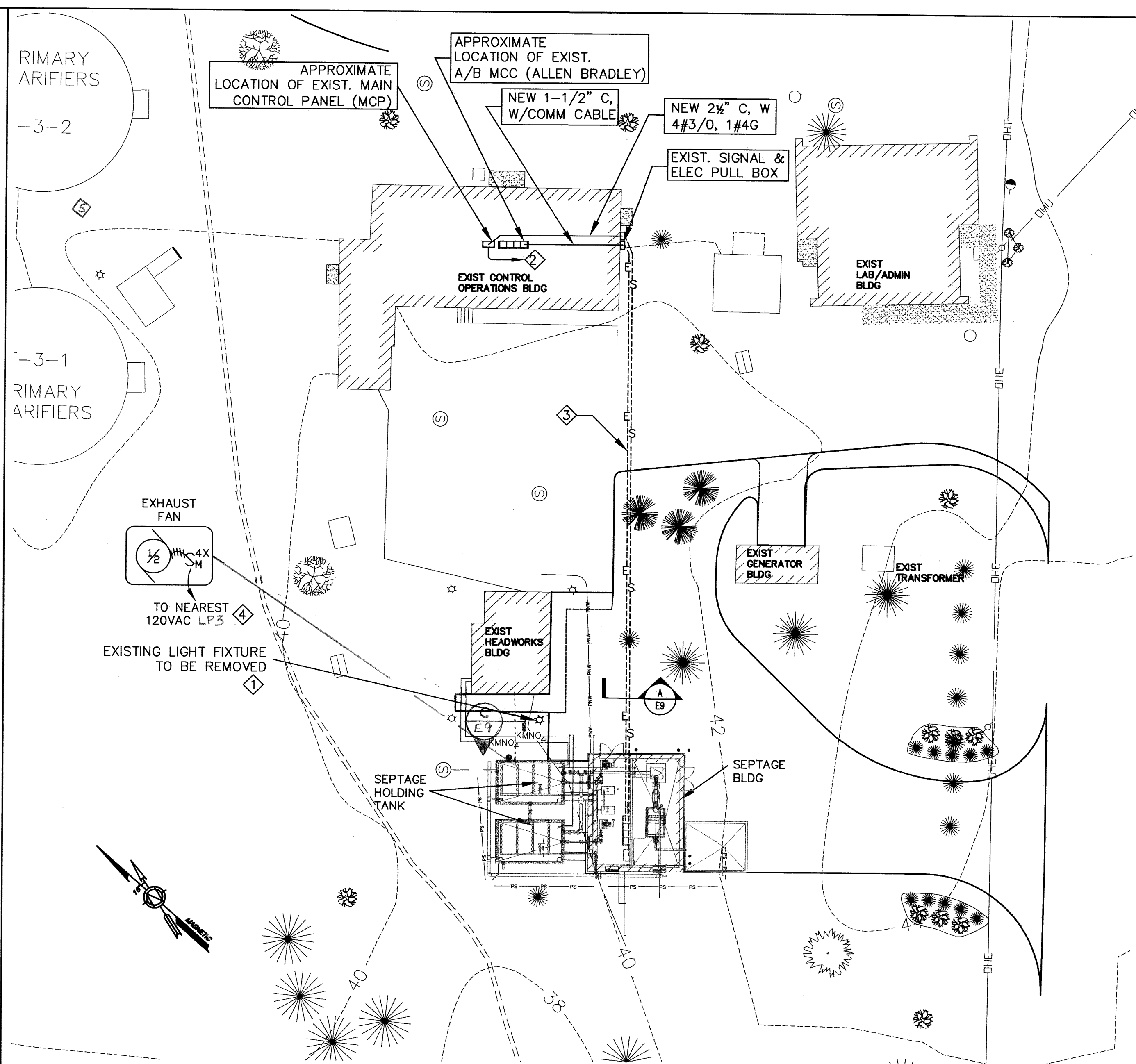
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E9

LIGHTING FIXTURE SCHEDULE								
TYPE	MANUFACTURER	CATALOG NUMBER	TYPE	COLOR	MOUNTING	VOLTAGE	LAMPS	REMARKS
A	HUBBELL	EWL042R-SPDR-E1	FLUOR	WHITE	SURFACE	120	(2) F32T8	MOUNT FLUSH TO CEILING
B	HUBBELL	HLEM120	INC	GRAY	CEILING	120	(1) 150 WATT	MOUNT FLUSH ON CEILING IN CLASS 1, DIV1, GROUP D AREAS
C	HUBBELL	PRM-100H-128-1-RS	MH	BRONZE	WALL 9'-4"	120	(1) 100W MH	WITH PBT-1 PHOTOCELL
D	HUBBELL	N412-25-2	EMERG.	GRAY	WALL @ 8'	120	(2) 25W	MOUNT FLUSH ON WALL ABOVE DOOR @ 8' A.F.F.
E	FEDRAL SIGNAL	400R	ALARM	RED	WALL 9'-4"	120	(1) 40W	WITH HORN MODEL 350 AND ACCESSORY MOUNTING KIT 400 HMK*AC

NOTE:

PEASE WWTF SEPTAGE RECEIVING BUILDING LIGHTING FIXTURE SCHEDULE
SCALE: NONE

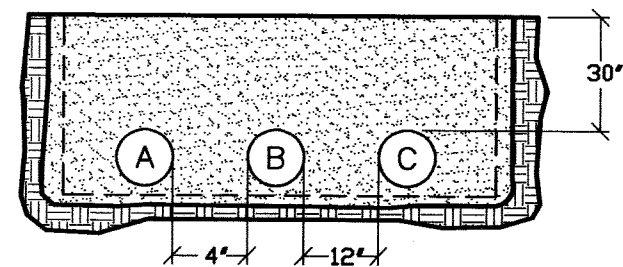
2
E9



PEASE WWTF SEPTAGE BUILDING ELECTRICAL SITE PLAN
SCALE: 1"=20'-0"

3
E9

DUCT BANK SCHEDULE				
DUCT BANK SECTION NO.	CONDUIT	EQUIPMENT	WIRE	CONNECTION
A E9	(A) 2-1/2" C	MCC-A	4#3/0, 1#4G	NEW POWER WIRING TO NEW MCC-A @ SEPTAGE BUILDING FROM EXISTING MCC A/B @ OPERATIONS/CONTROL BUILDING.
	(B) 2-1/2" C	SPARE		SPARE CONDUIT FROM NEW MCC-A @ SEPTAGE BUILDING TO EXISTING MCC @ CONTROL BUILDING.
	(C) 1-1/2" C	PLC @ SEPTAGE BUILD	COMM CABLE	COMMUNICATION WIRING FROM NEW SEPTAGE BUILDING PLC#7 TO SCADA COMPUTER IN LAB VIA EXISTING MCP @ OPERATIONS/CONTROL BUILDING.
B E9	(A) 1" C	MCC-A	8# 14 CABLES	NEW SIGNAL, ALARM WIRING FROM NEW SCADA PLC#7 IN SEPTAGE BUILDING TO ODOR CONTROL PANEL OUTDOORS.
	(B) 1-1/2" C	SPARE		SPARE CONDUIT FROM NEW MCC-A @ SEPTAGE BUILDING TO ODOR CONTROL PANEL OUTDOORS.
	(C) 1-1/2" C	FILTER CONTROL PANEL	3#6, 1#10G	NEW POWER WIRING FROM NEW MCC-A @ SEPTAGE BUILDING TO ODOR CONTROL PANEL OUTDOORS.
C E9	(A) 1" C	TEMPERATURE PROBE	2#14	INFLUENT TEMPERATURE PROBE DATA TO PLC#7



DUCT BANK SECTION
A
E9

- KEY ELECTRICAL NOTES
- 1. ELECTRICAL CONTRACTOR TO ELECTRICALLY DISCONNECT AND REMOVE EXISTING POLE LIGHT WITH ASSOCIATED EQUIPMENT.
 - 2. FURNISH AND INSTALL 2" UNDERGROUND CONDUIT WITH ETHERNET COMMUNICATION CABLE BETWEEN EXISTING MAIN CONTROL PANEL (MCP) AND THE SCADA WORKSTATION COMPUTER IN THE LAB/ADMIN BUILDING.
 - 3. COORDINATE NEW UNDERGROUND CONDUIT LOCATION WITH EXISTING UNDERGROUND ELECTRIC CONDUIT, PROCESS PIPING AND STRUCTURES PRIOR TO EXCAVATION.
 - 4. INSTALL 3/4" CONDUIT WITH 3#10, 1#10G TO NEAREST 120 VAC PANEL. INSTALL (1)/20, 1P BREAKER WITH SAME STYLE, AIC, AND RATING AS REQUIRED.
 - 5. INSTALL HIGH WETWELL ALARM FLOAT SWITCH INTERMEDIATE PUMPING STATION (SEE C.I.D.#1).

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PEASE SEPTAGE BUILDING
ELECTRICAL SITE & LIGHTING PLAN
WASTEWATER FACILITIES UPGRADE
CITY OF PORTSMOUTH
PORTSMOUTH, N.H.

DWG NO
E-9

SHEET
58 OF 71

RECORD DRAWING

smr
Engineering, PC

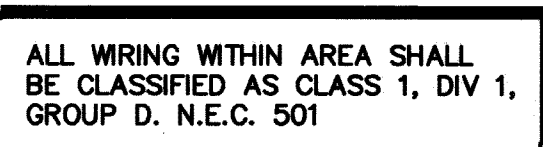
Electrical, Instrumentation
& Control Systems Design
5 Medallion Center, Greeley Street, Merrimack, NH 03054
Phone 603-428-3313 Fax 603-428-3486

Drawn: JWC
Checked: JWC/SMR
Approved: SMR
Date: 2/19/02
Book No.:
Project No.:
Dwg. ID:
Scale:

ISSUE FOR
APPROVAL
By: Date:
CONSTRUCTION
By: Date:
RECORD DRAWING
By: Date: 2/25/05
APPD: JWC

NO. REVISIONS

1. ALL WIRING IN THE NEW SEEPAGE RECEIVING BUILDING SHALL BE WITHIN RGS RACEWAY SYSTEM, ALL WIRING DEVICES, J-BOXES, PULL BOXES, DISCONNECT SWITCHES, PANELS, ETC. SHALL BE PROVIDED WITH NEMA 4X STAINLESS STEEL ENCLOSURES (PUMP ROOM), AND. NEMA 7 XP STAINLESS STEEL ENCLOSURES SEEPAGE RECEIVING ROOM.
2. ALL WIRING SYSTEMS OUTSIDE, ABOVE GROUND STRUCTURES SHALL BE WITHIN PVC COATED RGS CONDUIT.
3. PROCESS EQUIPMENT AND INSTRUMENTATION LOCATIONS SHOWN ARE DIAGRAMMATIC. REFER TO PROCESS SERIES DRAWINGS FOR EXACT LOCATION.



SCALE: $3/8"=1'-0"$

1
E10

RECORD DRAWING

*Electrical, Instrumentation
& Control Systems Design*
5 Medallion Center, Greeley Street, Merrimack, NH 03054
Phone 603/429-3313 Fax 603/429-3466

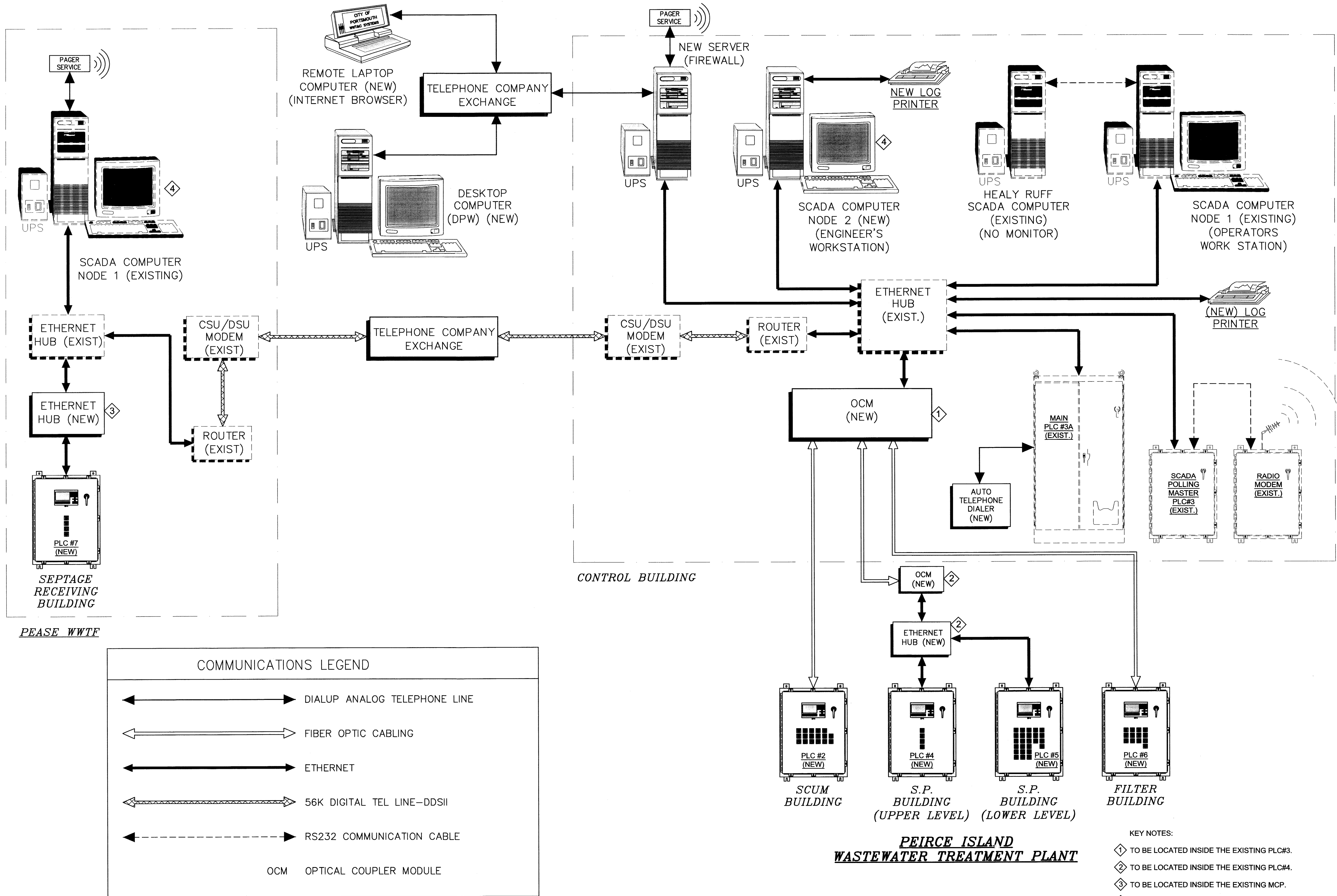
PEASE SEPTAGE BUILDING ELECTRICAL & INSTRUMENTATION PLAN

WASTEWATER FACILITIES UPGRADE

CITY OF PORTSMOUTH
PORTSMOUTH, N.H.

Underwood Engineers, Inc.

25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733



**CITY OF PORTSMOUTH WASTEWATER TREATMENT
FACILITY'S & COLLECTION SCADA ARCHITECTURE**

RECORD DRAWING

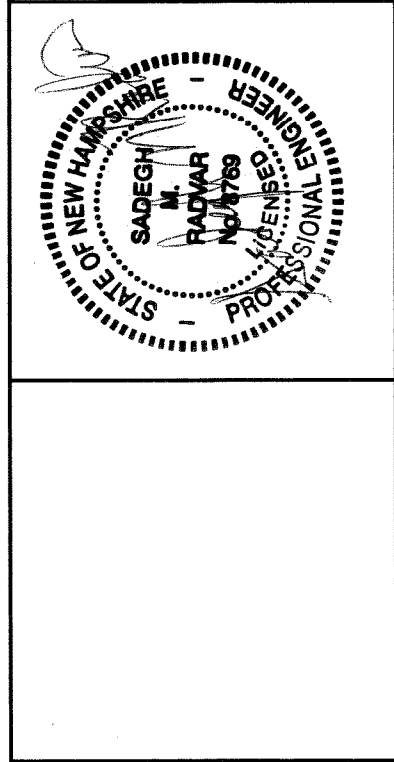
smr
Engineering, PC

Electrical, Instrumentation
& Control Systems Design
5 Medallion Center, Greeley Street, Merrimack, NH 03004
Phone: 603/429-3313 Fax: 603/429-3486

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DWG NO	SHEET
1-1	65 OF 71

SCADA BLOCK DIAGRAM
WASTEWATER FACILITIES UPGRADE
CITY OF PORTSMOUTH
PORTSMOUTH, N.H.

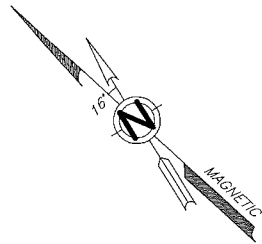


Drawn	JWC
Designed	JWC/SMR
Checked	SMR
Approved	SMR
Date	2/19/02
Book No.	-
Project No.	-
Dwg. ID	AS SHOWN
Scale	-

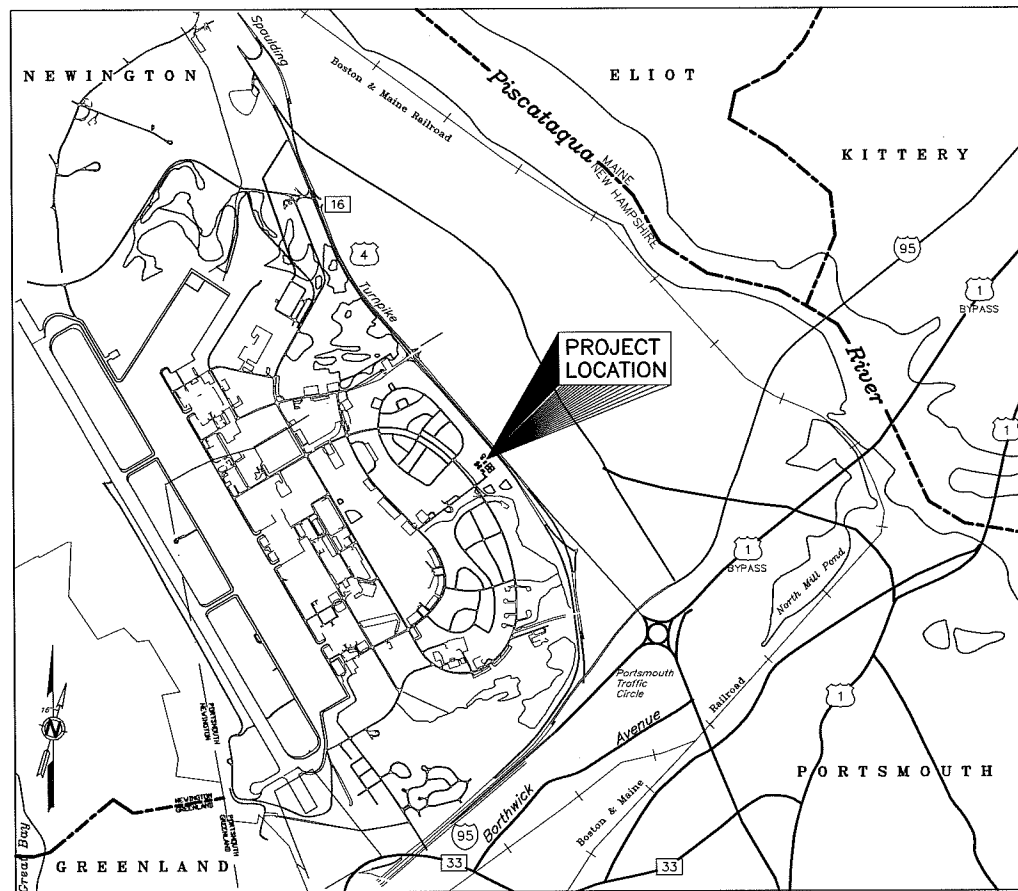
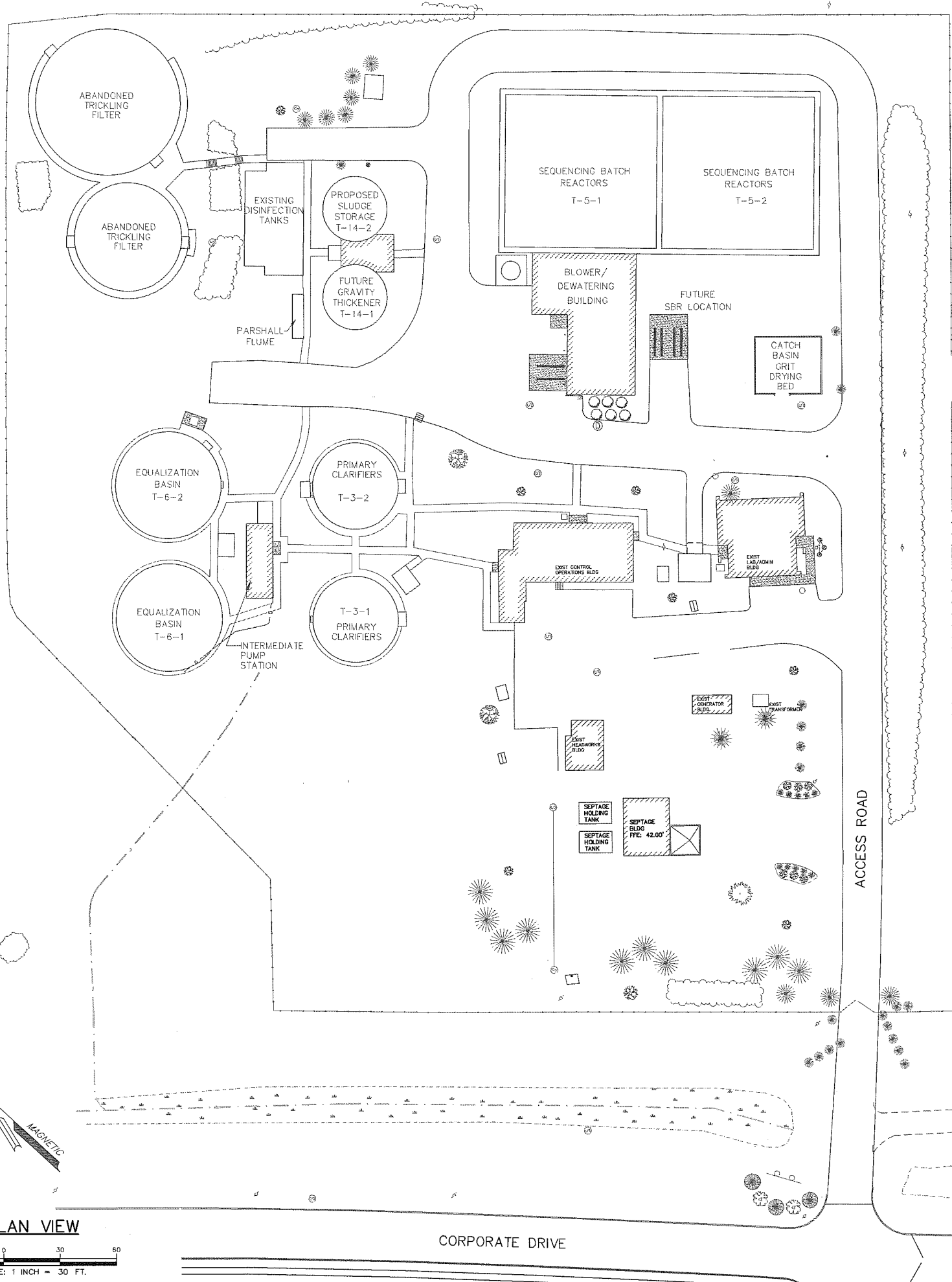
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CONSTRUCTION			
RECORD DRAWING			
REVISIONS			
APD			

2013 Underwood Drawings

H:\Real Numbers\Portsmouth\1775 Pease Evaluation\Work Plans\1775 FIGURE 1.dwg, Layout1, 12/31/2013 4:03:19 PM, tjb



PLAN VIEW
SCALE: 1 INCH = 30 FT.



VICINITY MAP
SCALE: 1 INCH = 2000 FT.

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FIGURE 1 - SITE PLAN

PEASE WWTF

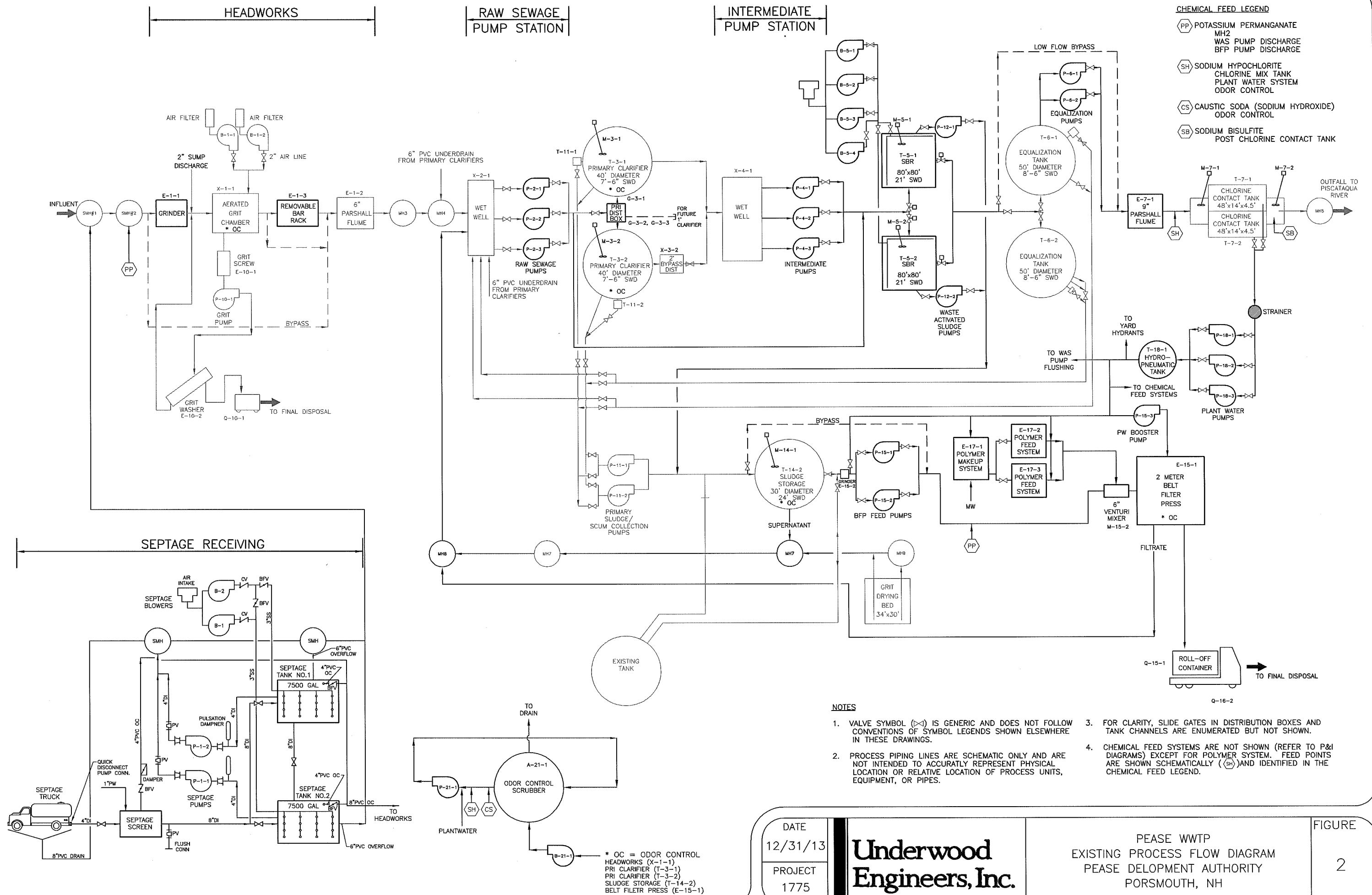
PEASE
PORTSMOUTH, NH

DWG NO
SHEET
OF 178

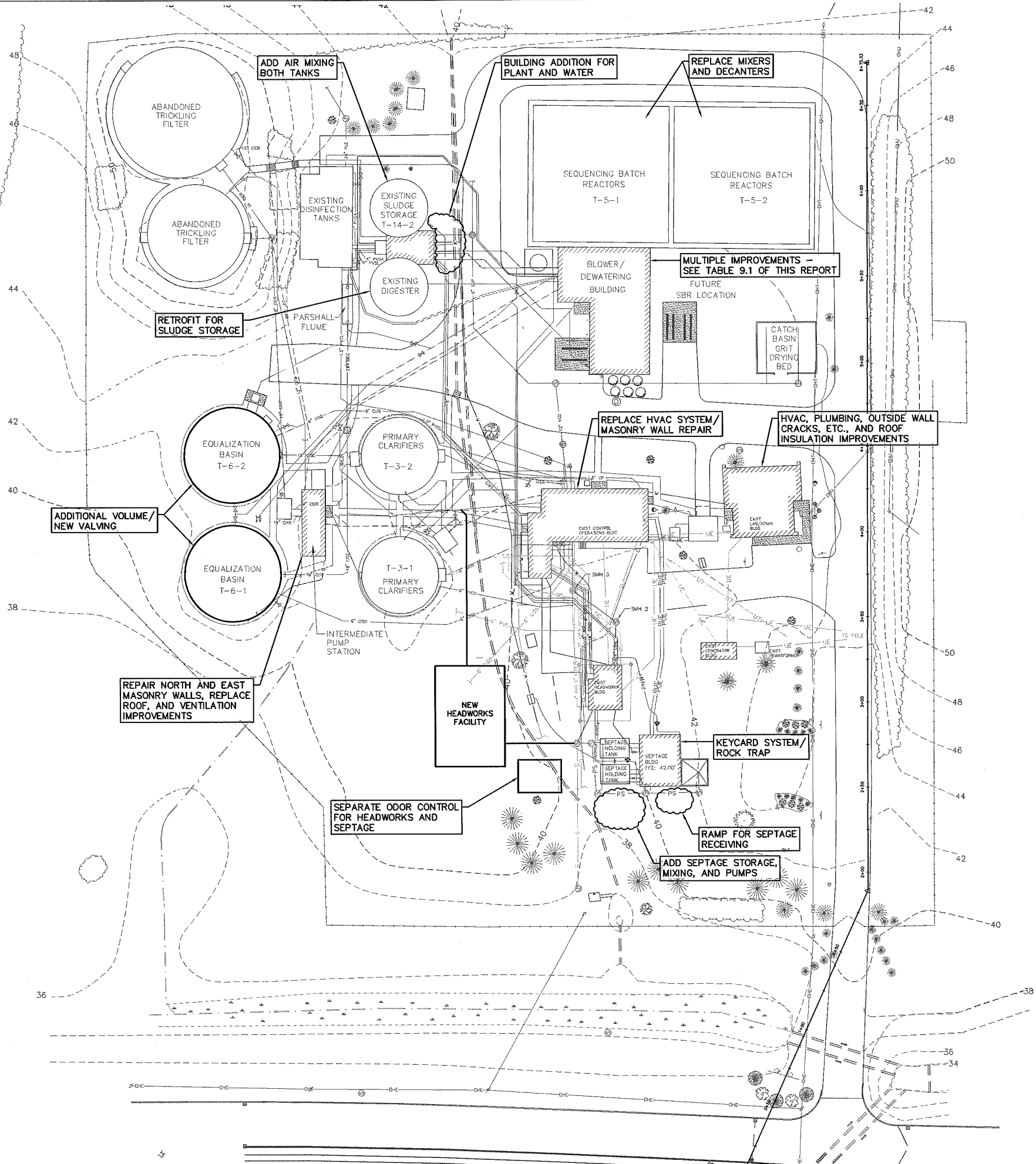


25 Vaughan Mall, Portsmouth, N.H. 03801
Tel. 603-436-6192 Fax. 603-431-4733

Drawn/Chk.		RMG	
Designed	-	Checked	-
Approved	-	Date	9/3/2013
Book No.	-	Project No.	1775
Dwg. ID	-	Scale	AS SHOWN
ISSUE FOR		REVISIONS	
APPROVAL	By	NO.	APPD
Date	By	Date	By
CONSTRUCTION	By	Date	By
RECORD DRAWING	By	Date	By

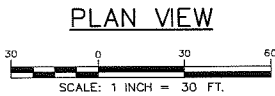


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NOTE:

SEE TABLE 9.1 IN SECTION 9 OF THIS REPORT FOR MORE DETAIL. THIS DRAWING IS NOT INTENDED TO SHOW ALL SHORT TERM IMPROVEMENTS.

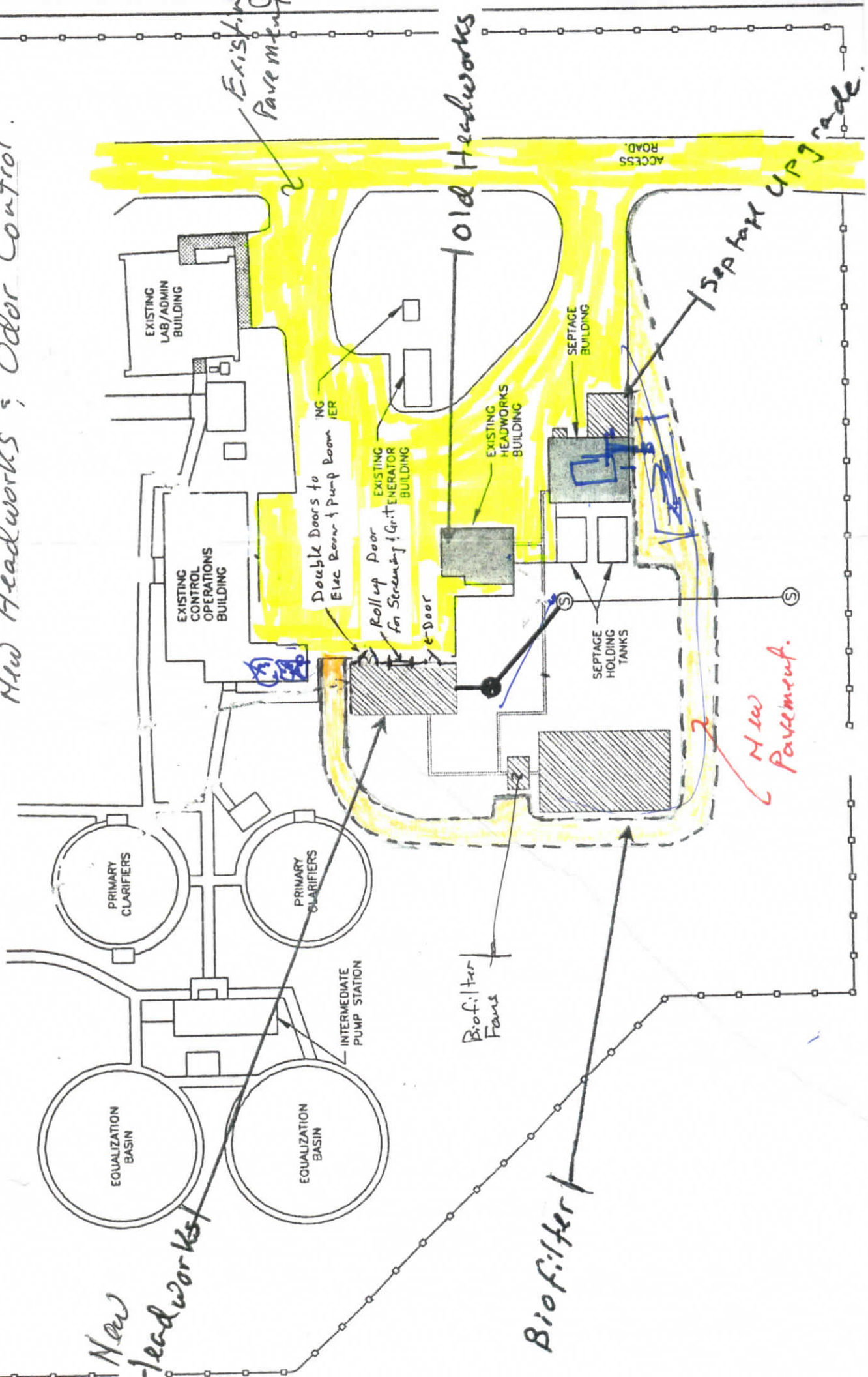


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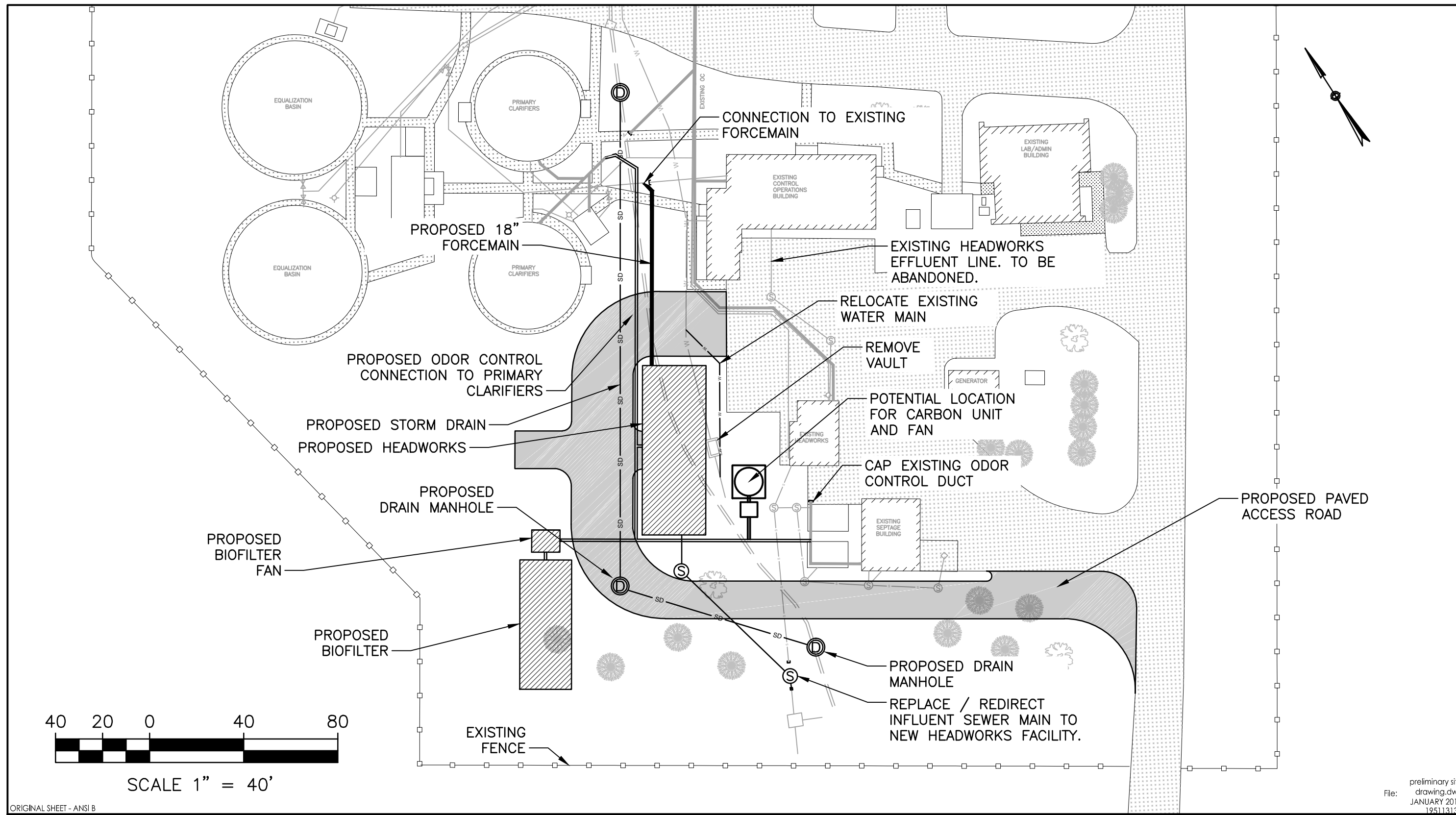
DWG NO		FIGURE 5 - WORK PLAN SHORT TERM IMPROVEMENTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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2016 Stantec Drawings Part 1

Please WWT
New Headworks & Odor Control.



2016 Stantec Drawings Part 2



ORIGINAL SHEET - ANSI B

preliminary site
 drawing.dwg
 JANUARY 2016
 195113133

Legend

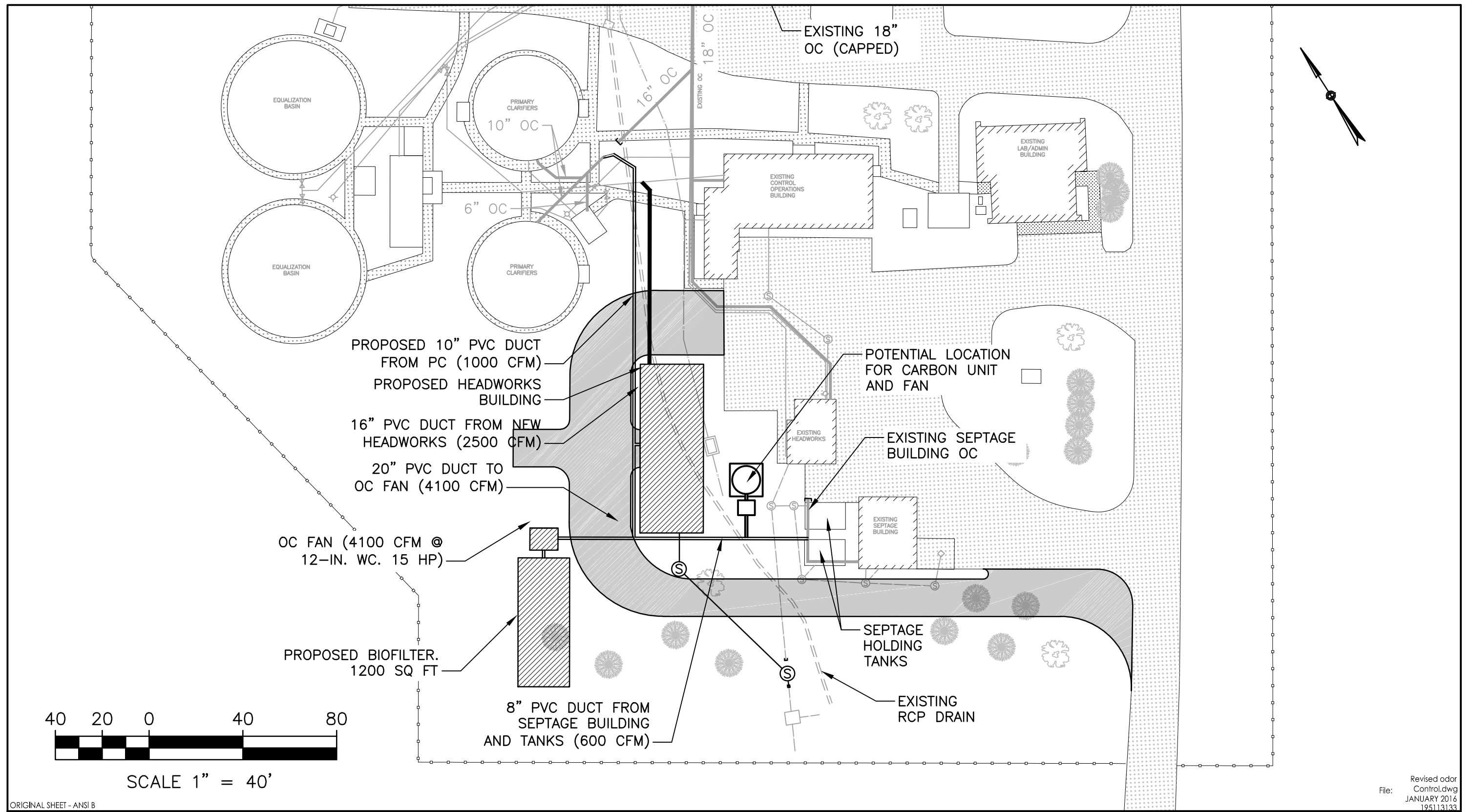
Notes

PROPOSED ROADWAY TO ACCOMMODATE
 AN SU-40 VEHICLE

Client/Project
 PORTSMOUTH, NH
 PEASE WWTF
 NEW HEADWORKS & ODOR CONTROL
 Figure No.
 XX
 Title
 PRELIMINARY SITE PLAN



5 DARTMOUTH DRIVE
 AUBURN, NH 03032
 TEL 603-669-8672
 FAX 603-669-7636



ORIGINAL SHEET - ANSI B

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Control.dwg
JANUARY 2016
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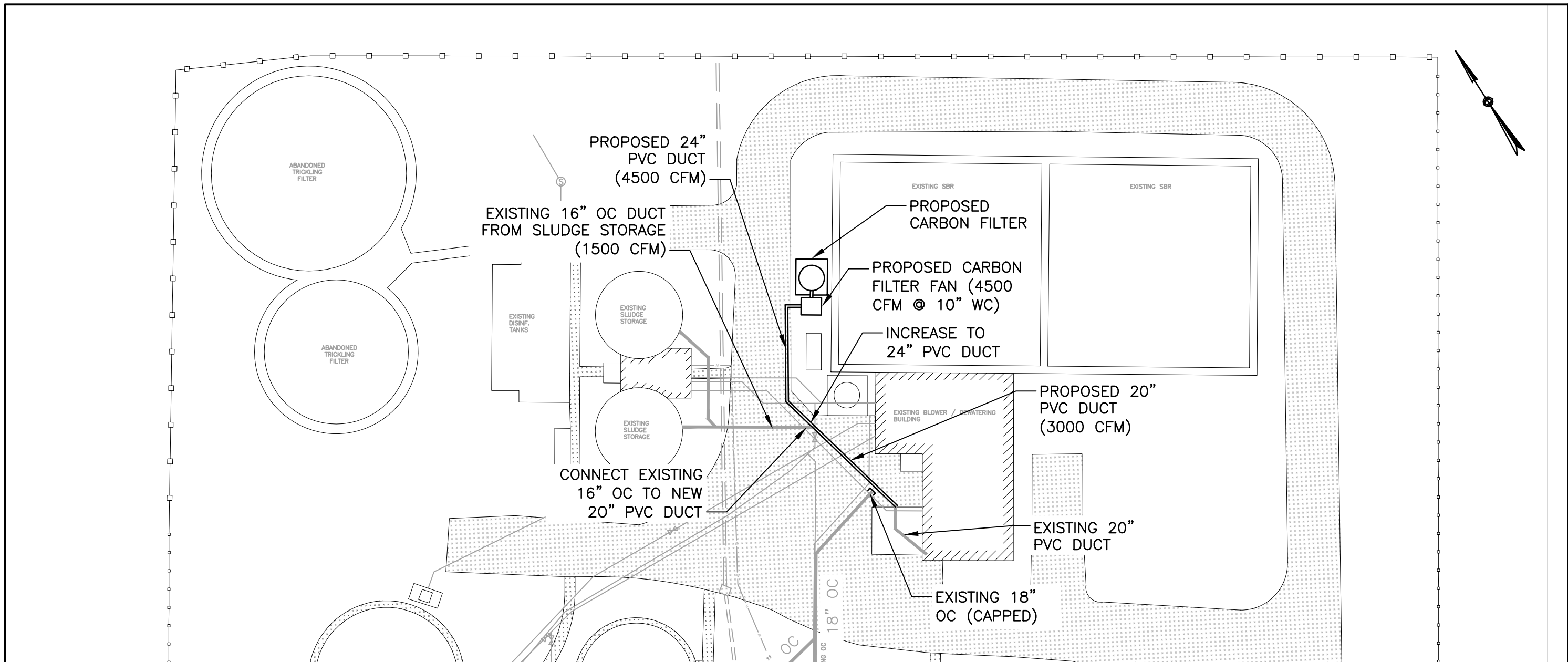
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Client/Project
PORTSMOUTH, NH
PEASE WWTF
NEW HEADWORKS & ODOR CONTROL
Figure No.
1.1

Title
HEADWORKS ODOR CONTROL



5 DARTMOUTH DRIVE
AUBURN, NH 03032
TEL 603-669-8672
FAX 603-669-7636



SCALE 1" = 40'

ORIGINAL SHEET - ANSI B

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JANUARY 2016
195113133

Legend

Notes



5 DARTMOUTH DRIVE
AUBURN, NH 03032

TEL 603-669-8672
FAX 603-669-7636

Client/Project
PORTSMOUTH, NH
PEASE WWTF
NEW HEADWORKS & ODOR CONTROL
Figure No.
2.1
Title
ODOR CONTROL
SYSTEM IMPROVEMENTS

Appendix D: Pease WWTP Data

Septage Volumes (July 2012-June 2015):

2012		2013		2014		2015	
Month	Gallons	Month	Gallons	Month	Gallons	Month	Gallons
Jan		Jan	99,500	Jan	71,750	Jan	84,450
Feb		Feb	72,350	Feb	64,250	Feb	50,500
Mar		Mar	66,250	Mar	82,000	Mar	75,500
Apr		Apr	170,450	Apr	190,200	Apr	133,850
May		May	205,300	May	157,650	May	150,300
Jun		Jun	179,850	Jun	191,150	Jun	218,711
Jul	162,550	Jul	157,300	Jul	159,100	Jul	
Aug	221,700	Aug	220,775	Aug	223,000	Aug	
Sep	176,300	Sep	198,150	Sep	204,000	Sep	
Oct	195,050	Oct	191,650	Oct	190,850	Oct	
Nov	213,250	Nov	208,000	Nov	153,000	Nov	
Dec	125,250	Dec	128,050	Dec	134,050	Dec	
Total	1,094,100	Total	1,897,625	Total	1,821,000	Total	713,311
Average	182,350	Average	158,135	Average	151,750	Average	118,885
Min	125,250	Min	66,250	Min	64,250	Min	50,500
Max	221,700	Max	220,775	Max	223,000	Max	218,711

Influent Combined Septage and Wastewater Characteristics:

Pease WWTP Influent Wastewater Characteristics July, 2012 - June, 2015					
	Flow	BOD ₅		TSS	
	(MGD)	(mg/L)	(lb/d)	(mg/L)	(lb/d)
Average	0.479	349.0	1465.8	530.1	2222.4
Min	0.00	201.4	671.2	246.4	878.9
Max	4.00	510.1	2156.4	892.3	3975.9

Weekday vs. Weekend Flow Data:

Month	Average Weekday Flow (MGD)	Average Weekend Flow (MGD)
Jan-13	0.625	0.367
Feb-13	0.759	0.608
Mar-13	0.969	0.850
Apr-13	0.716	0.408
May-13	0.746	0.573
Jun-13	0.951	0.722
Jul-13	0.785	0.513
Aug-13	0.550	0.415
Sep-13	0.770	0.507
Oct-13	0.476	0.325
Nov-13	0.309	0.250
Dec-13	0.703	0.555
Jan-14	0.804	0.607
Feb-14	0.654	0.534
Mar-14	0.720	0.647
Apr-14	0.751	0.830
May-14	0.696	0.481
Jun-14	0.614	0.534
Jul-14	0.610	0.426
Aug-14	0.584	0.390
Sep-14	0.509	0.339
Oct-14	0.481	0.358
Nov-14	0.556	0.410
Dec-14	0.717	0.608
Jan-15	0.580	0.501
Feb-15	0.501	0.376
Mar-15	0.639	0.546
Apr-15	0.790	0.619
May-15	0.606	0.460
Jun-15	0.692	0.592
Jul-15	0.698	0.543

Influent Combined Septage and Wastewater Flow (July 2012-June 2015):

Month	Jul - Dec, 2012			2013			2014			Jan - Jun, 2015		
	ADF	Min	Max	ADF	Min	Max	ADF	Min	Max	ADF	Min	Max
	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
Jan				0.477	0.16	3.21	0.589	0.09	4	0.472	0.12	1.41
Feb				0.496	0.13	4	0.472	0.16	2.83	0.373	0.15	1.07
Mar				0.708	0.07	4	0.576	0.09	3.62	0.521	0.13	1.36
Apr				0.480	0	4	0.601	0.21	4	0.643	0	3.41
May				0.489	0	4	0.476	0.01	4	0.470	0.14	4
Jun				0.680	0.16	4	0.442	0.15	2.95	0.557	0.26	1.99
Jul	0.499	0.11	3.68	0.506	0.01	4	0.442	0.13	4			
Aug	0.469	0.01	1.72	0.408	0.08	4	0.402	0.08	1.93			
Sep	0.414	0.08	1.23	0.528	0.01	4	0.364	0.08	4			
Oct	0.449	0.11	1.13	0.345	0.01	1.62	0.370	0.11	1.64			
Nov	0.455	0.14	3.68	0.204	0	1.63	0.403	0.12	4			
Dec	0.415	0.08	3.59	0.498	0.08	4	0.584	0.21	2.37			

Avg	0.450	0.09	2.51	0.485	0.06	3.54	0.477	0.12	3.28	0.506	0.133	2.207
Min	0.414	0.01	1.13	0.204	0	1.62	0.364	0.01	1.64	0.373	0	1.07
Max	0.499	0.14	3.68	0.708	0.16	4	0.601	0.21	4	0.643	0.26	4

Influent Combined Septage and Wastewater Average BOD₅ Characteristics (July 2012-June 2015):

Month	Jul - Dec, 2012		2013		2014		Jan - Jun, 2015	
	(mg/L)	(lb/d)	(mg/L)	(lb/d)	(mg/L)	(lb/d)	(mg/L)	(lb/d)
Jan			219.5	931.5	218.0	1163.4	313.2	1339.7
Feb			251.3	1108.1	254.5	958.3	383.5	1316.7
Mar			201.4	1204.6	266.0	1161.5	467.7	2085.5
Apr			311.9	1282.9	346.9	1862.3	266.6	1507.8
May			338.3	1398.6	358.7	1468.7	400.0	1722.6
Jun			351.2	2156.4	370.0	1382.5	373.3	1803.4
Jul	347.8	1569.3	430.1	1935.3	320.4	1335.3		
Aug	363.2	1538.0	487.9	1757.9	510.1	1952.6		
Sep	370.7	1429.9	394.0	1975.4	411.1	1263.6		
Oct	379.6	1540.9	406.7	1239.6	416.2	1377.1		
Nov	347.4	1391.6	369.5	671.2	422.2	1532.1		
Dec	248.6	926.5	266.2	1283.7	306.8	1612.7		

Avg	342.9	1399.4	335.6	1412.1	350.1	1422.5	367.4	1629.3
Min	248.6	926.5	201.4	671.2	218.0	958.3	266.6	1316.7
Max	379.6	1569.3	487.9	2156.4	510.1	1952.6	467.7	2085.5

Appendix E: Site Visit Status Report

Site Visit Status Report

Pease Tradeport Wastewater Treatment Plant - Portsmouth, New Hampshire



Pease Wastewater Treatment Plant (Portsmouth City Council, 2015)

Ryan Clark

Katherine Hedberg

Rita Newman

January 22, 2016

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Headworks	4
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Notes

General Pease Information

- Treats industrial wastewater
- Septage is treated at 7¢/gallon
- Currently, the following towns are serviced (Pease is not a regional treatment facility)
 - Portsmouth
 - New Castle
 - Greenland
 - Rye
- Septage receipt operates from 730AM until 3PM each weekday except Fridays; closes at noon (no weekend collection)
- Pease receives the most septage in the summer
 - Have days where they receive around 30,000 gallons
- Wastewater inflow has increased over recent years, but septage inflow has not
- Increases in WW flow from the biotech company has led to an increase in BOD
- Grease trap waste is not accepted
- Pease is staffed with 2 individuals each week day (3 if it's a particularly busy day) for lab work and general maintenance/supervision of dewatering process
 - Staff rotates between Pease and Peirce Island plants
 - 1 staff member is on-call outside of regular work hours
 - 1 person is at the plant on Saturdays and Sundays
- Only one of two primary clarifiers is used

Septage Receipt Process

- Truck arrives with septage load, driver fills out paperwork
 - Trucks generally range from 3,000-5,000 gallons
- Unloads at septage receiving facility (may be done without assistance from plant operators) through exterior connection
 - NOTE: Buses/RVs and portable toilet waste can be collected through the storm drain adjacent to the exterior connection
 - Buses/RV's waste is typically up to a couple hundred gallons
 - Portable toilet waste is usually around 750 gallons
 - Both wastes typically don't upset the treatment process
- Septage goes through screening
- Screw mechanism brings solid waste up into disposal bags
 - Disposed of in Rochester, New Hampshire
- Septage collects in aerated holding tanks (7,000 gallons each)
 - Once a tank fills to 30", pumps automatically turn on
 - Once a tank fills to 40", the overflow built into the tanks is used to put septage directly into headworks through a storm drain
 - Although each tank is 7,000 gallons, their true capacity is about 5,000 gallons
 - Tanks are cleaned out twice per year
- Septage is pumped through two 4" hose pumps into headworks
 - The pumps are automated and set at a constant flow rate
- Screen system is cleaned every Friday afternoon by an operator

Lonza Biologics Waste

- Glycol, a food source, is in some of the Lonza waste
- Pease is negotiating with Lonza to separate the glycol from the waste before discharging it to the plant

Headworks

- Entire facility will no longer be in use after construction of new headworks
- Current operation uses a grinder as a screening mechanism
- Grit is cleaned out 3 times per year

Sludge Removal

- Sludge is dewatered with a belt filter press which compresses sludge into mass that collects in a dumpster
- Sludge enters dewatering at 2% liquid (by volume?), leaves process at 20% liquid
- Dewatering only occurs once each week

Information about Anticipated Problems

- Grit removed from septage holding tanks twice each year (spring and autumn); removes 1-1.5 yards each time
- Operators may be interested in a rock trap to remove larger solids
- Septage intake annually is stable and not anticipated to increase
 - Most septage accepted in early autumn (Oct), least in late winter (Feb)
 - 2015 septage received: 1,891,950 gallons
- Septage trucks are NOT turned away due to full tanks; excess septage is immediately passed through headworks
- Having additional septage capacity could allow for more septage to be bled into the system on weekends
- The hose pumps restrict the flow of septage to headworks because it is set at a constant rate; this doesn't allow for more septage to enter at low-flow times

Information about Existing Problems

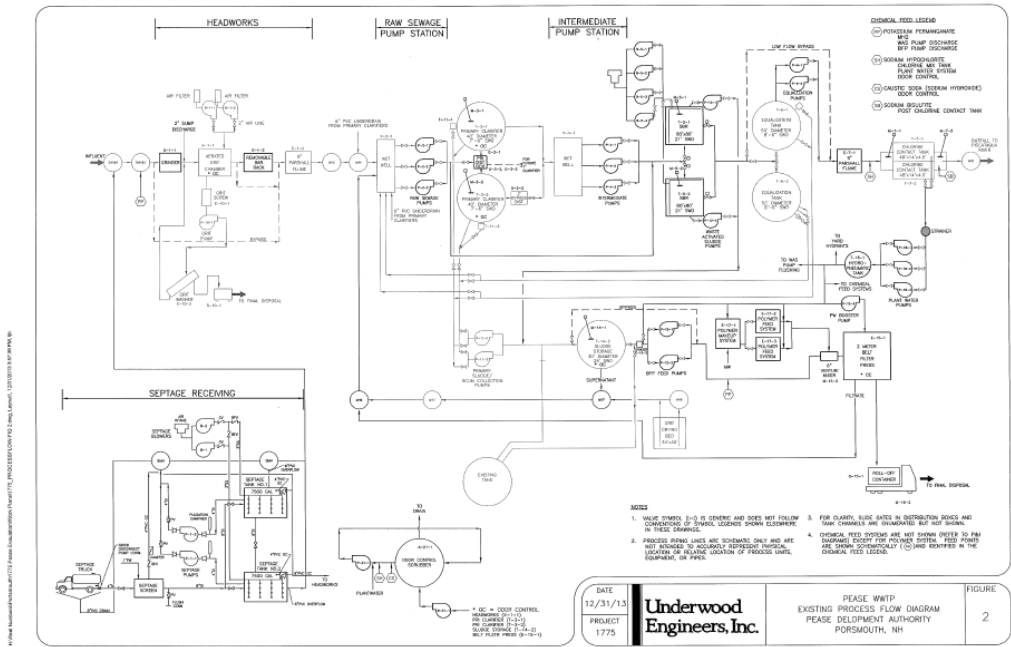
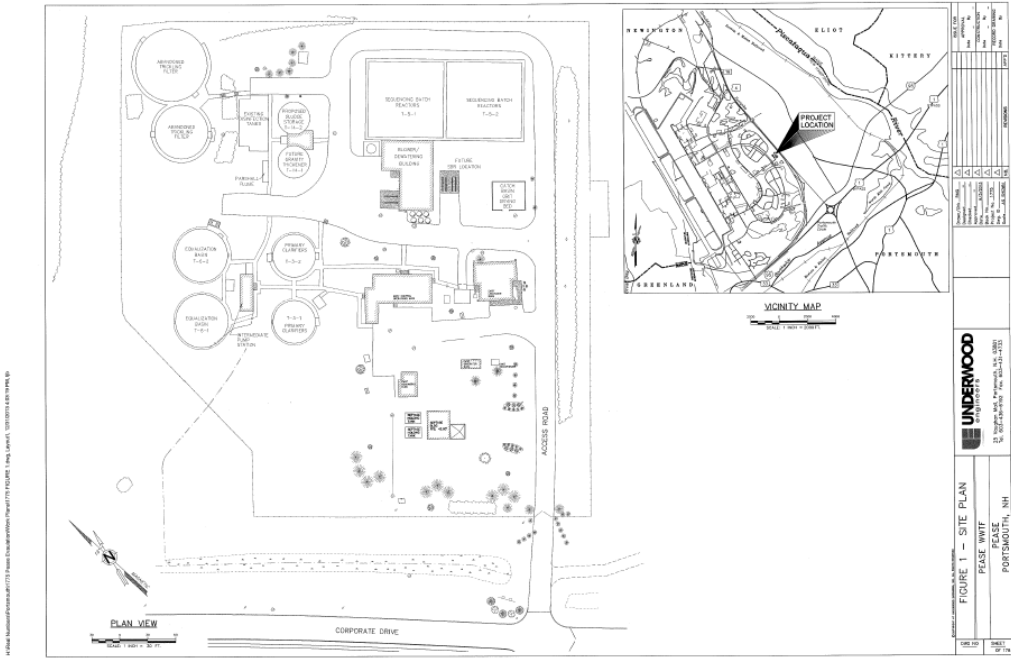
- Septage trucks need to "blow off" to remove all load contents (facility valve is at a higher elevation than the truck valve; is not gravity fed)
 - Look into the turning radius and area where trucks access the station (if possible add a graded ramp; allow for gravity feed)
- Truck contents is never sampled or tested prior to unload; they want to implement a flow meter and a card reader system to record truck unloading for billing, this is a topic of discussion with the City
 - No samples are taken because the Plant doesn't have the staff for it; they use the honors system
 - Most haulers have been coming to the plant for at least 10 years
- Rags collect in the screw that moves solids into the waste bags; this causes operational problems
- Adding grit removal to septage pretreatment is a potential area of improvement

Software Application Used

PlanGrid

To organize our notes during and after the site visit, the team used an application called PlanGrid. PlanGrid is a cloud based service that takes blueprints as pdfs directly on tablets or phones. The application allows for team members to be added to the project to allow fast communication and updates when new drawings are added. When changes are made in the app, it automatically syncs with the computer. If there are changes, that are not synced a note (Not Current) will appear at the bottom.. The team can upload their respective modifications to a master plan drawing and can avoid overlapping data or consolidate into one comment.

Drawings from 2014 Report from Underwood Engineers



Site Visit Photos:



Septage Receiving Station Exterior



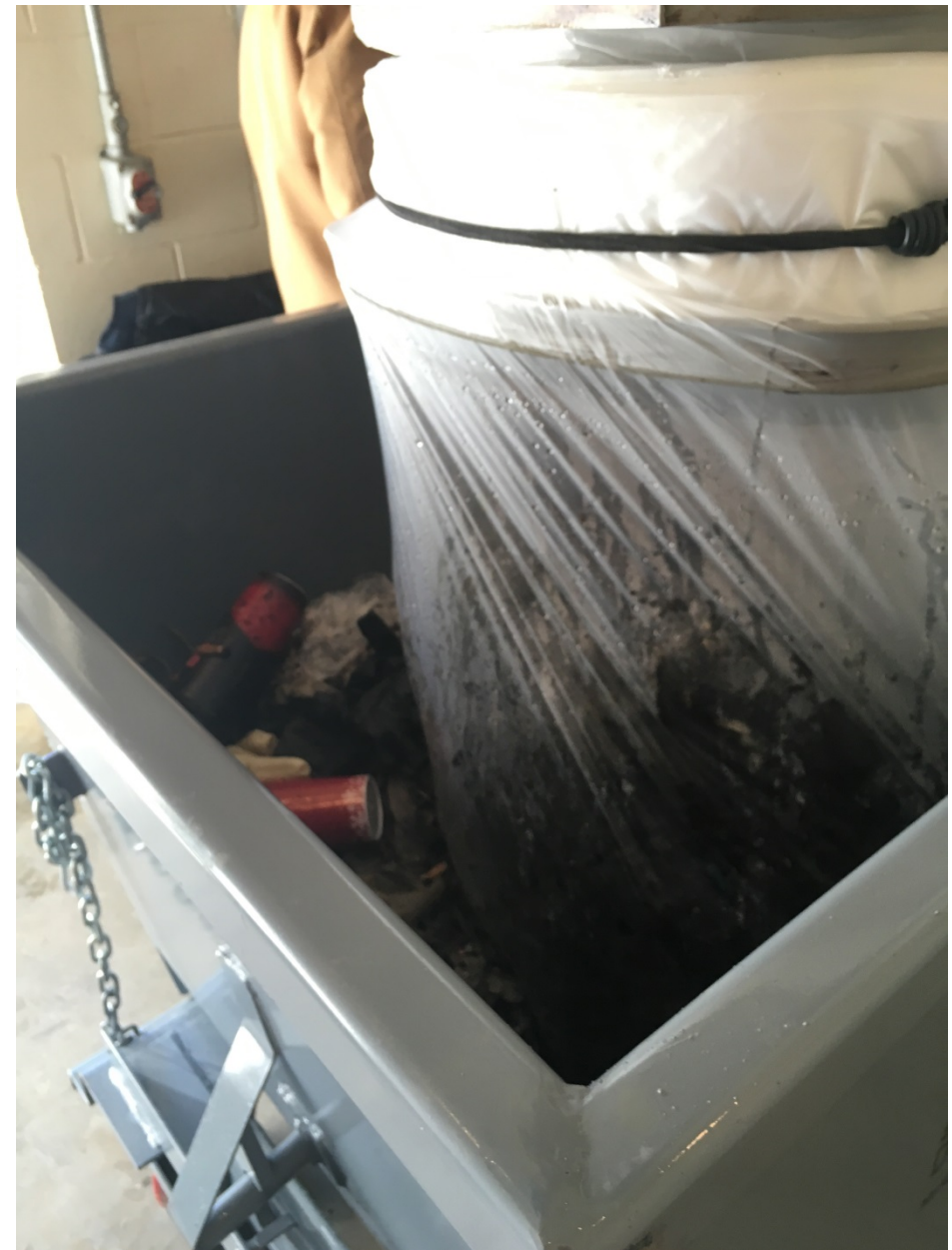
Septage Receiving Station Exterior - Unloading



Septage Receiving Station Exterior – Driveway Area



Septage Receiving Station Interior – Screening System



Septage Receiving Station Interior – Screening System



Septage Receiving Station Interior - Removal





Septage Receiving Station Interior – Cleaning Screens



Septage Receiving Station Exterior – Holding Tanks



Septage Receiving Station Exterior – Holding Tanks



Septage Receiving Station Exterior – Pump Station



Septage Receiving Station Interior – Pumps



Septage Receiving Station Interior – Cleaning Screens



Headworks Exterior



Headworks Exterior – Control Panel



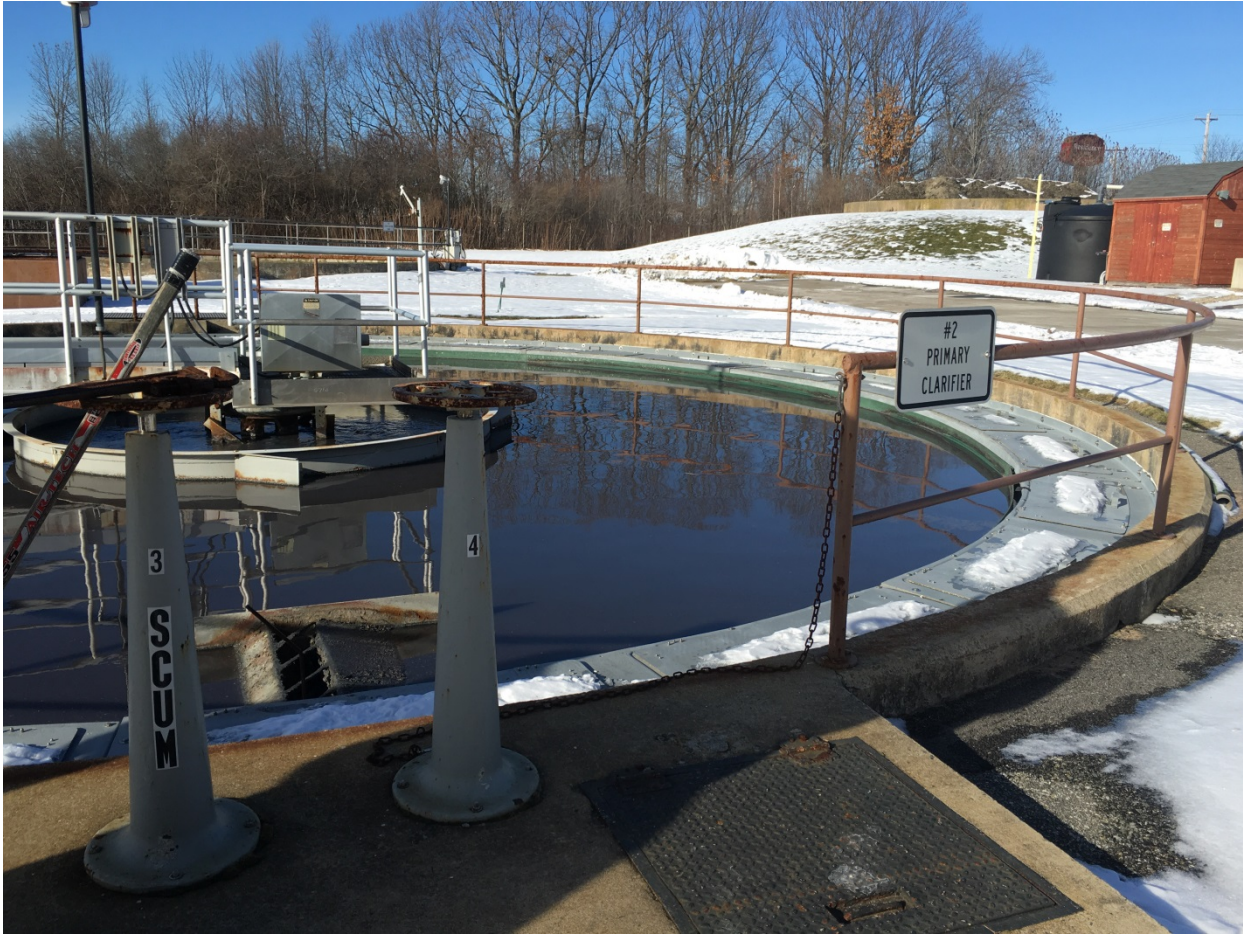
Headworks Interior – Screen and Grit Removal



Pump Station Interior



Primary Clarifier Tanks



Primary Clarifier Tanks



Elevated Views of Clarifiers and Sludge Storage



Sludge Storage Tanks Exterior



Chemical Feeds



Sequencing Batch Reactors (SBRs)



Sequencing Batch Reactor (SBR)





2 Meter Belt Filter Press

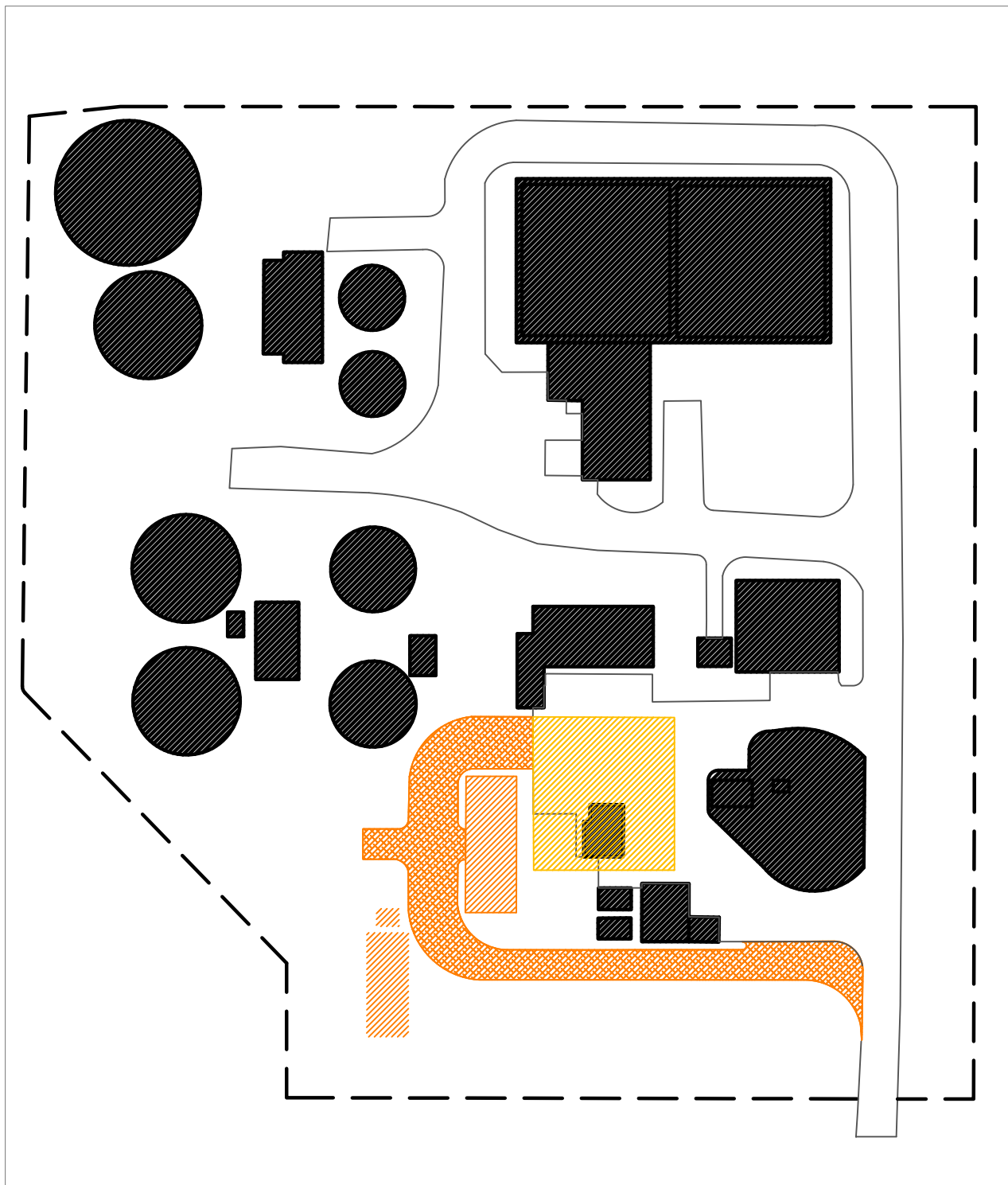


2 Meter Belt Filter Press



2 Meter Belt Filter Press into Roll-Off Container

Appendix F: CAD Drawings and Revit Models



ORIGINAL SHEET - ANSI A

**NOT TO SCALE

StantecProposed.dwg
March, 2016
MQP-SLI-STW6



5 Burlington Woods
Burlington, MA 01803-4511
www.stantec.com

Client/Project

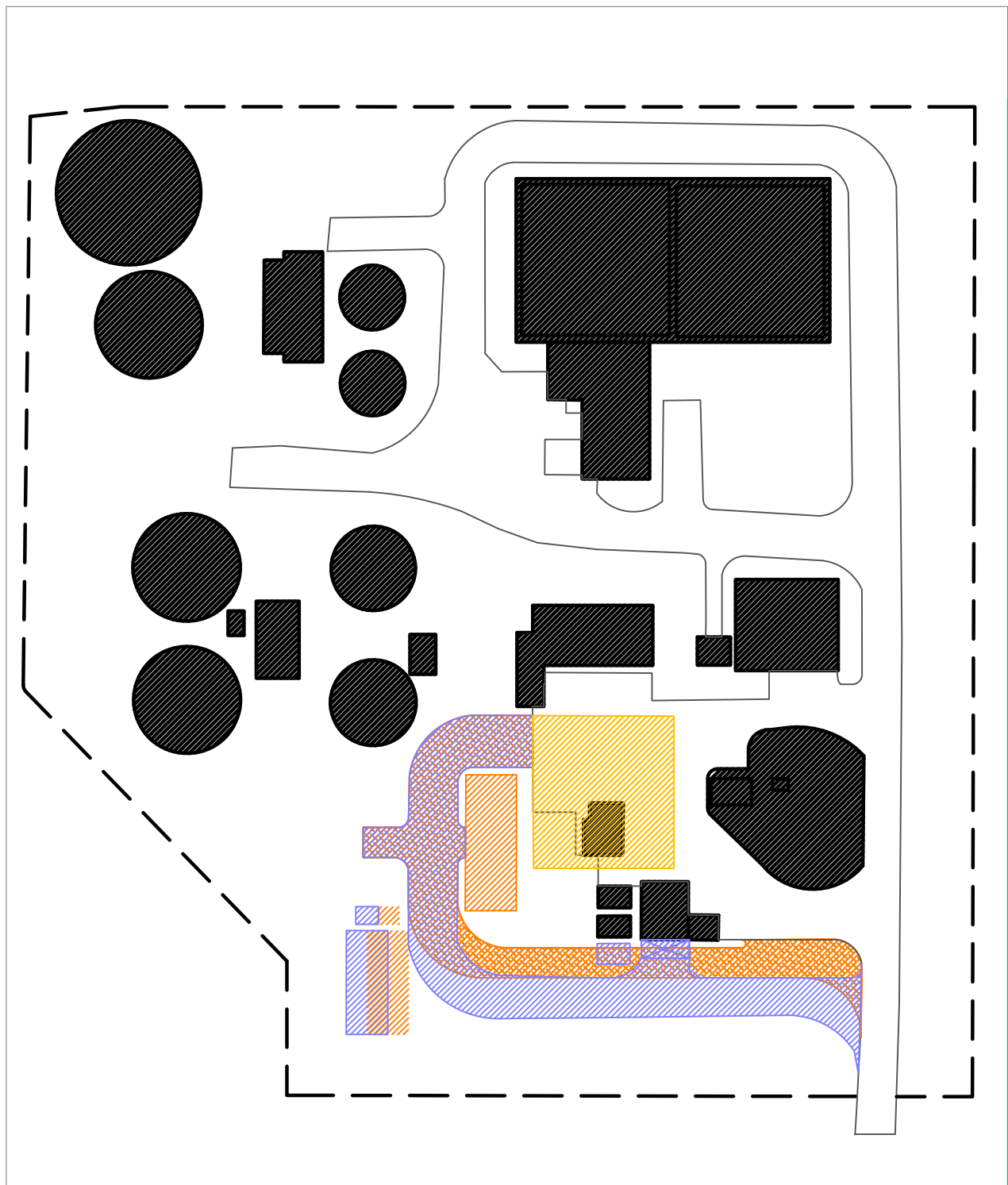
City of Portsmouth
Septage Upgrade
Pease WWTP

Figure No.

1.0

Title

Site Plan
Stantec Proposed



ORIGINAL SHEET - ANSI A

**NOT TO SCALE

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March, 2016
MQP-SL1-STW6



5 Burlington Woods
Burlington, MA 01803-4511
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Client/Project

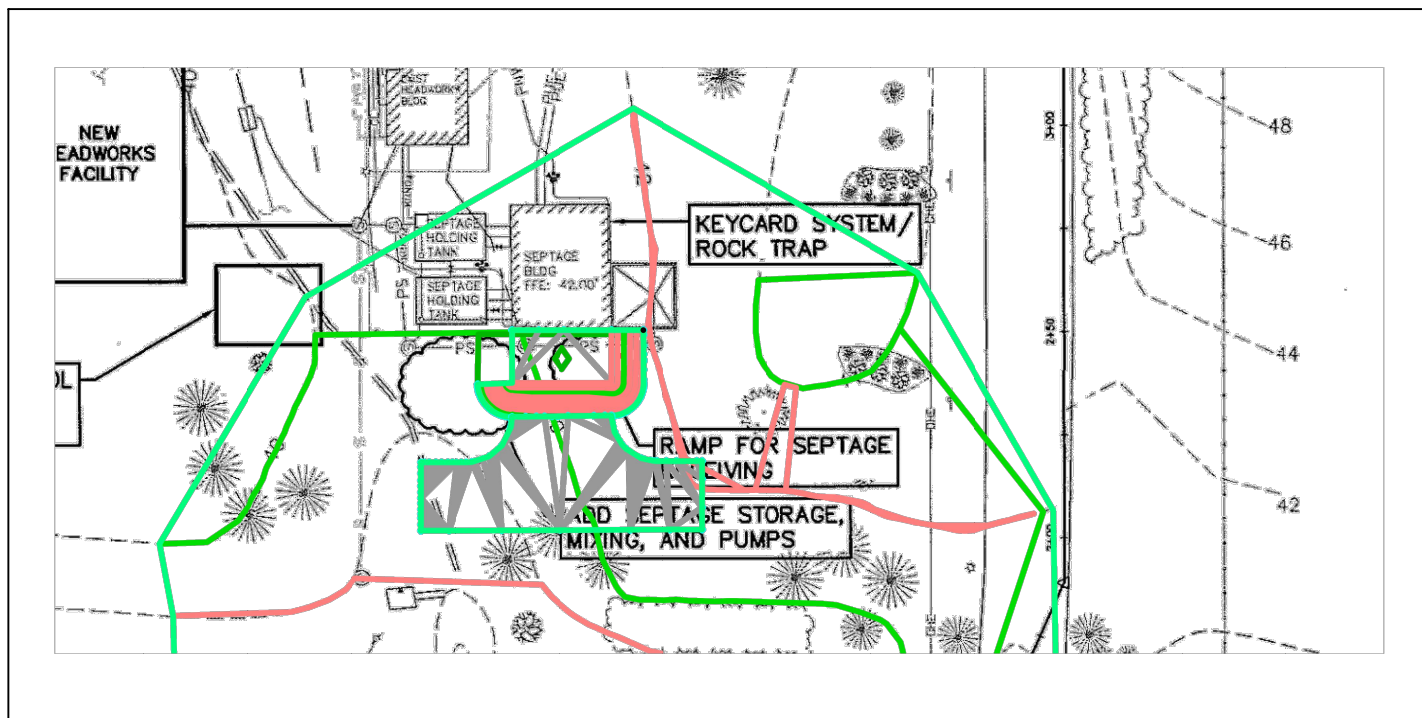
City of Portsmouth
Septage Upgrade
Pease WWTP

Figure No.

1.0

Title

Site Plan
Design Option 2



ORIGINAL SHEET - ANSI A

*Not To Scale

Option2RampGrading.dwg
March, 2016
MQP-SL1-STW6



5 Burlington Woods
Burlington, MA, 01803-4511
www.stantec.com

Client/Project

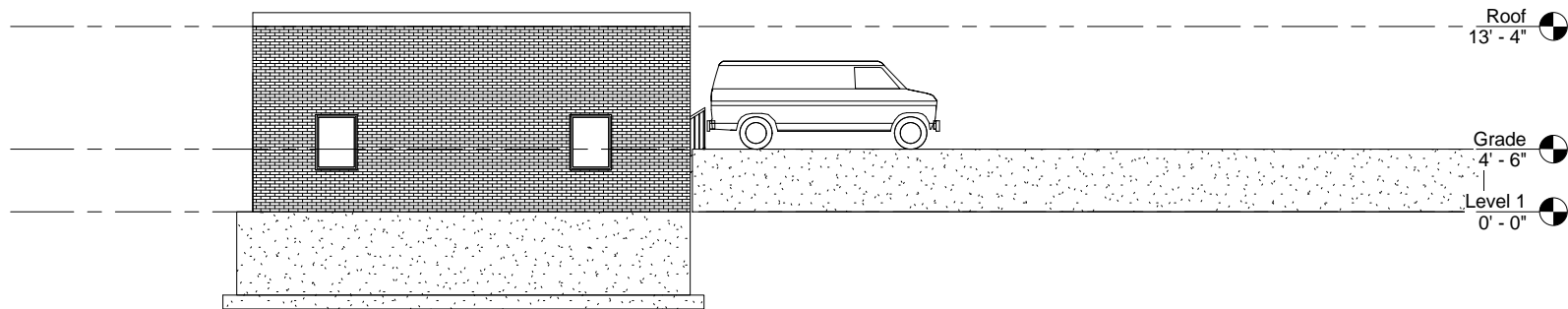
City of Portsmouth, NH
Pease WWTP
Septage Upgrade

Figure No.

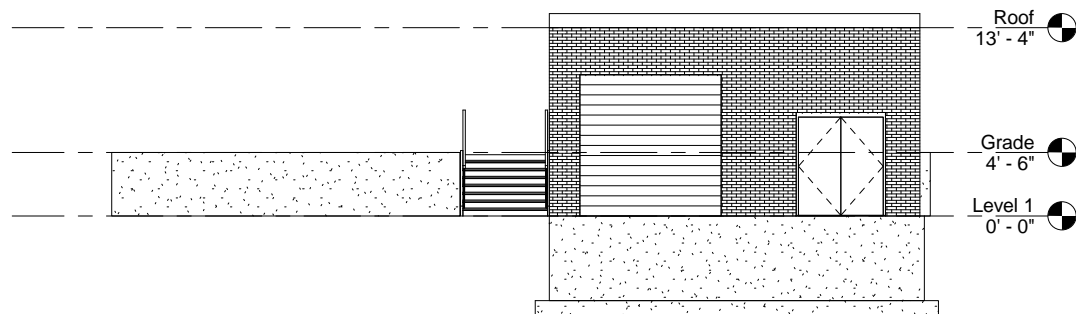
1.0

Title

Option 2 - Ramp Grading



① North
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② East
1/8" = 1'-0"



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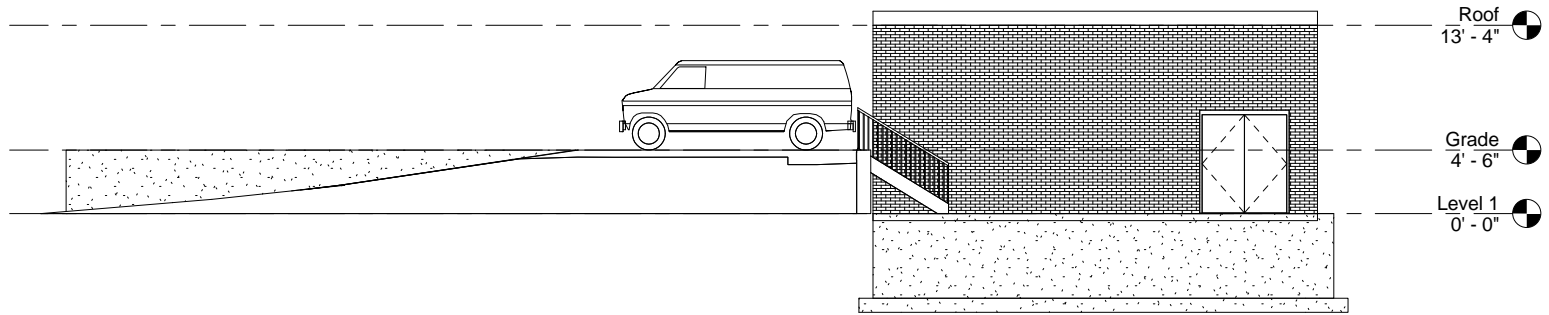
Option 2 Design Septage Upgrade, Pease

No.	Description	Date

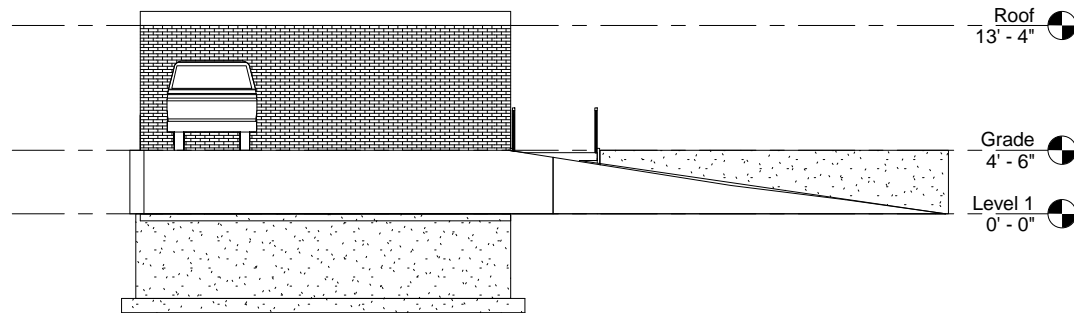
North & East Elevations

Project number	Project Number	A101
Date	Issue Date	
Drawn by	Author	
Checked by	Checker	
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① South
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② West
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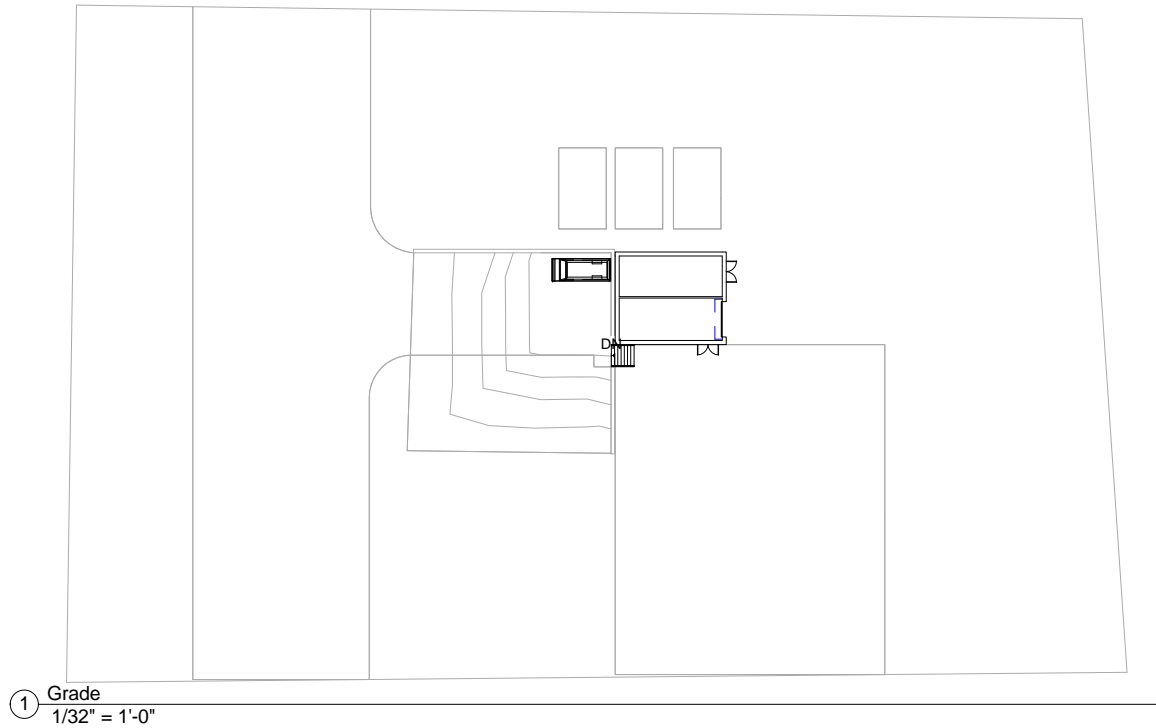
www.autodesk.com/revit

Option 2 Design Septage Upgrade, Pease

No.	Description	Date

South & West Elevation

Project number	Project Number	A102
Date	Issue Date	
Drawn by	Author	
Checked by	Checker	
Scale 1/8" = 1'-0"		



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Option 2 Design Septage Upgrade, Pease

No.	Description	Date

Site & Floor Plan		
Project number	Project Number	A103
Date	Issue Date	
Drawn by	Author	
Checked by	Checker	
Scale 1/32" = 1'-0"		



① 3D View 1



② 3D View 2



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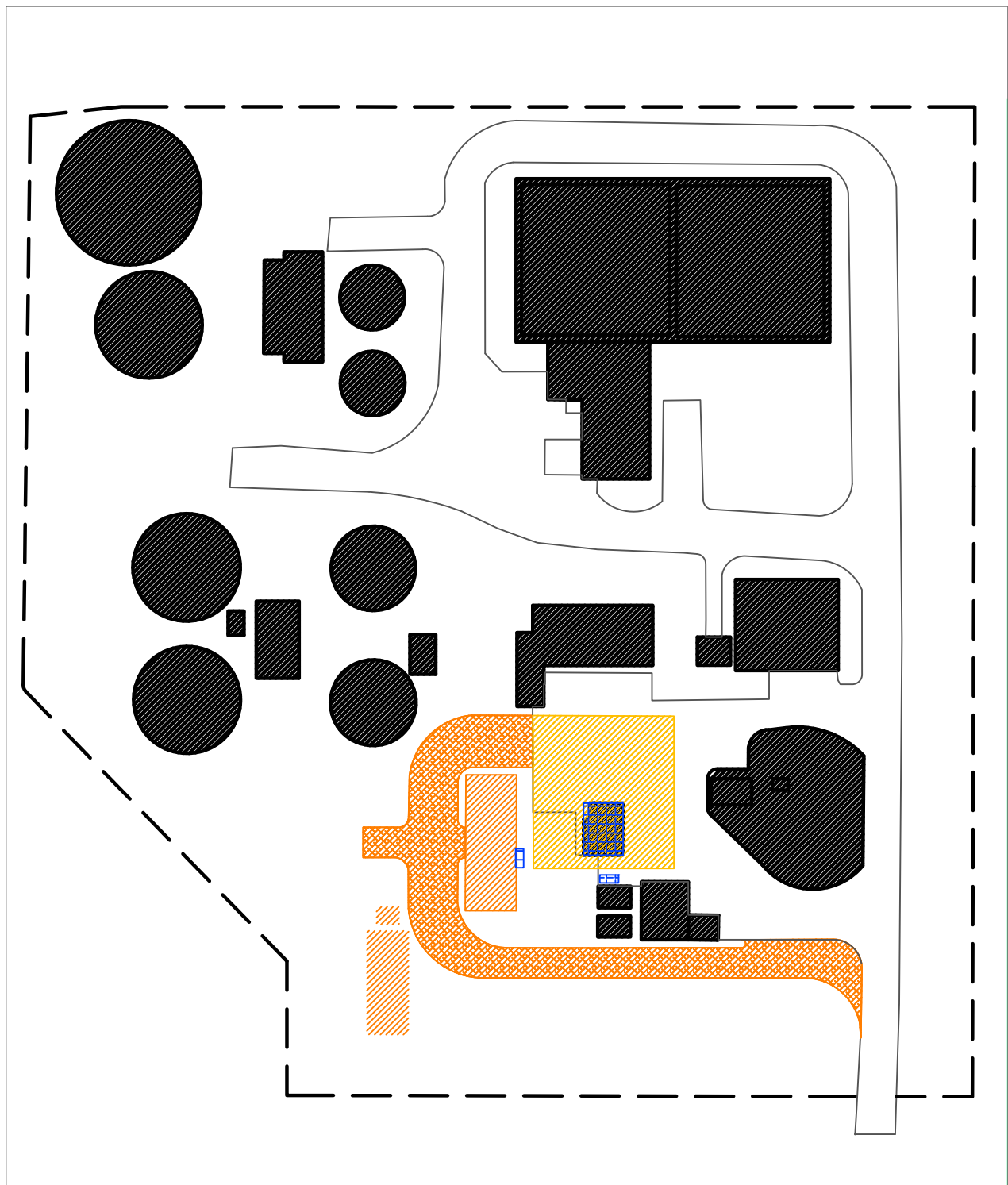
Option 2 Design Septage Upgrade, Pease

No.	Description	Date

3D Views

Project number	Project Number	A104
Date	Issue Date	
Drawn by	Author	
Checked by	Checker	
		Scale

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ORIGINAL SHEET - ANSI A

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MQP-SL1-STW6



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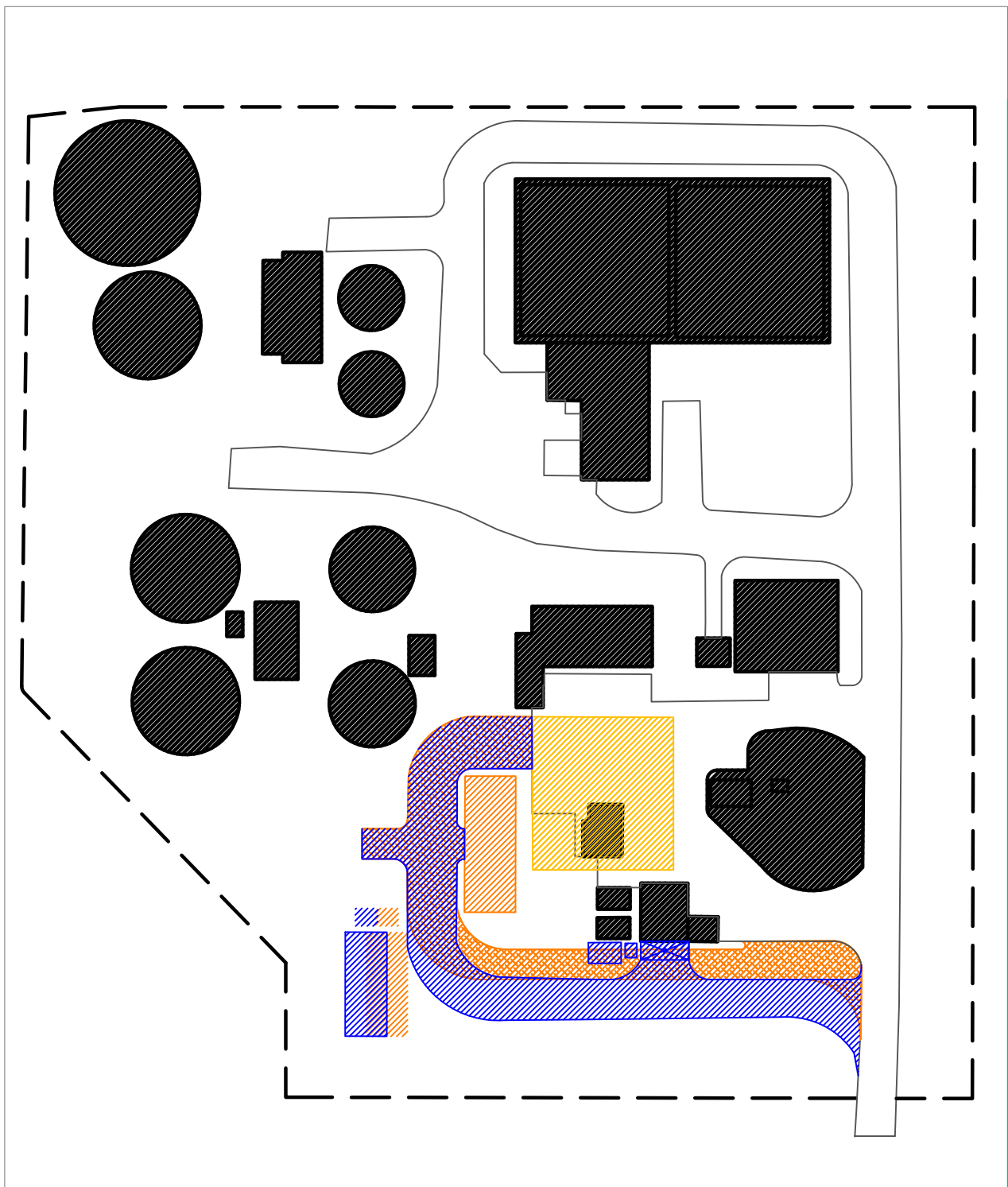
City of Portsmouth
Septage Upgrade
Pease WWTW

Figure No.

1.0

Title

Site Plan
Design Option 3



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**NOT TO SCALE

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March, 2016
MQP-SL1-STW6



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Client/Project

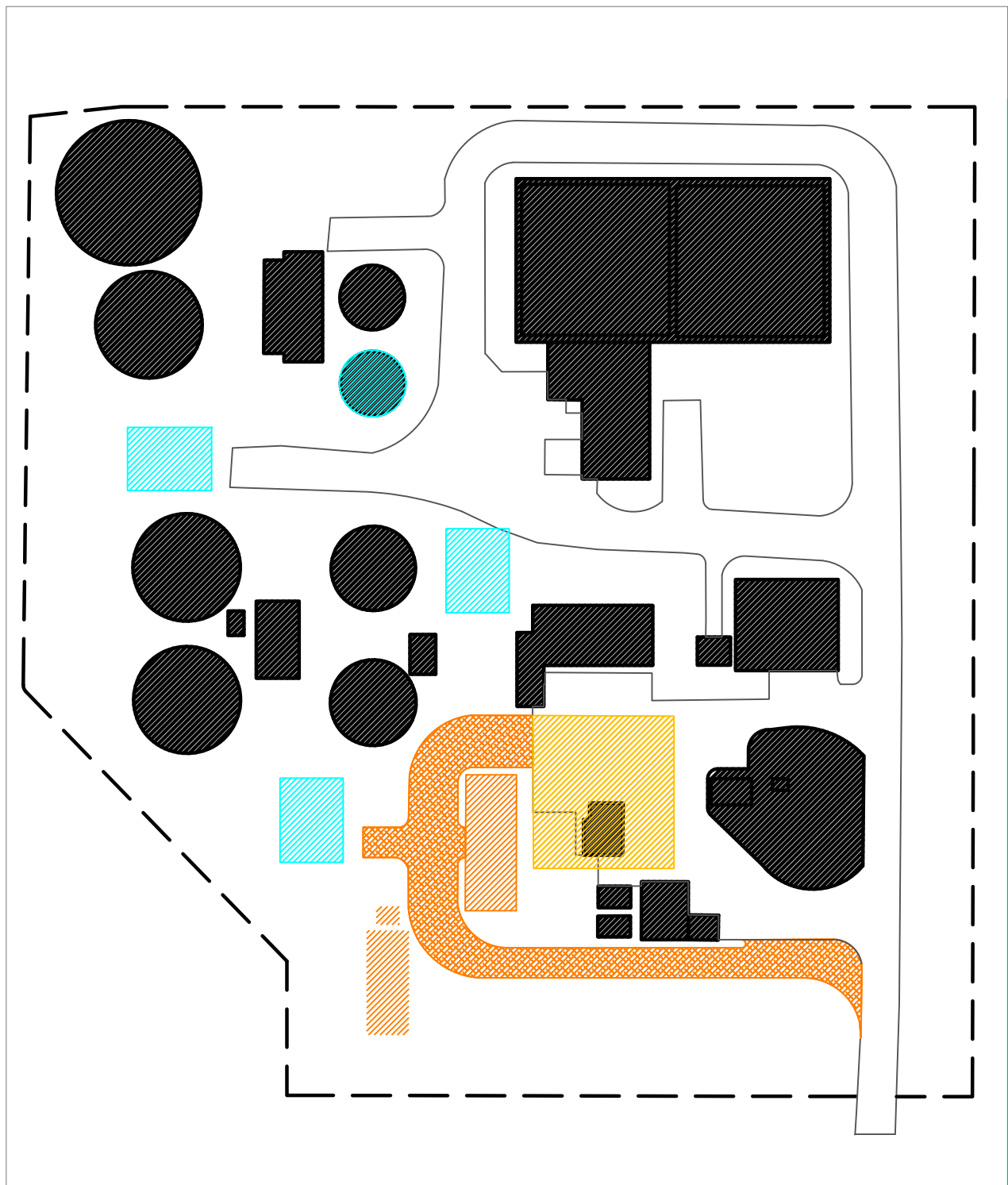
City of Portsmouth
Septage Upgrade
Pease WWTW

Figure No.

1.0

Title

Site Plan
Option 4



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March, 2016
MQP-SL1-STW6



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Client/Project

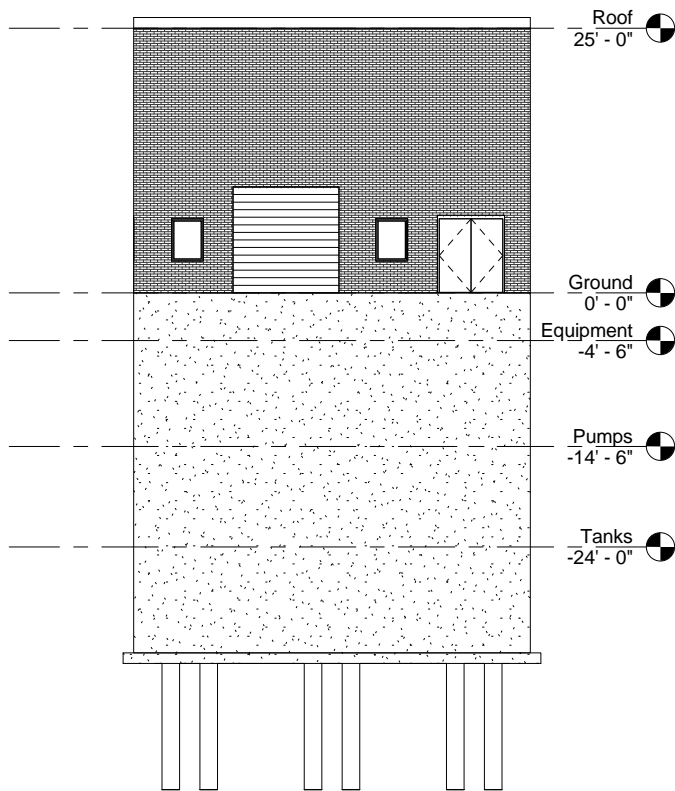
City of Portsmouth
Septage Upgrade
Pease WWTW

Figure No.

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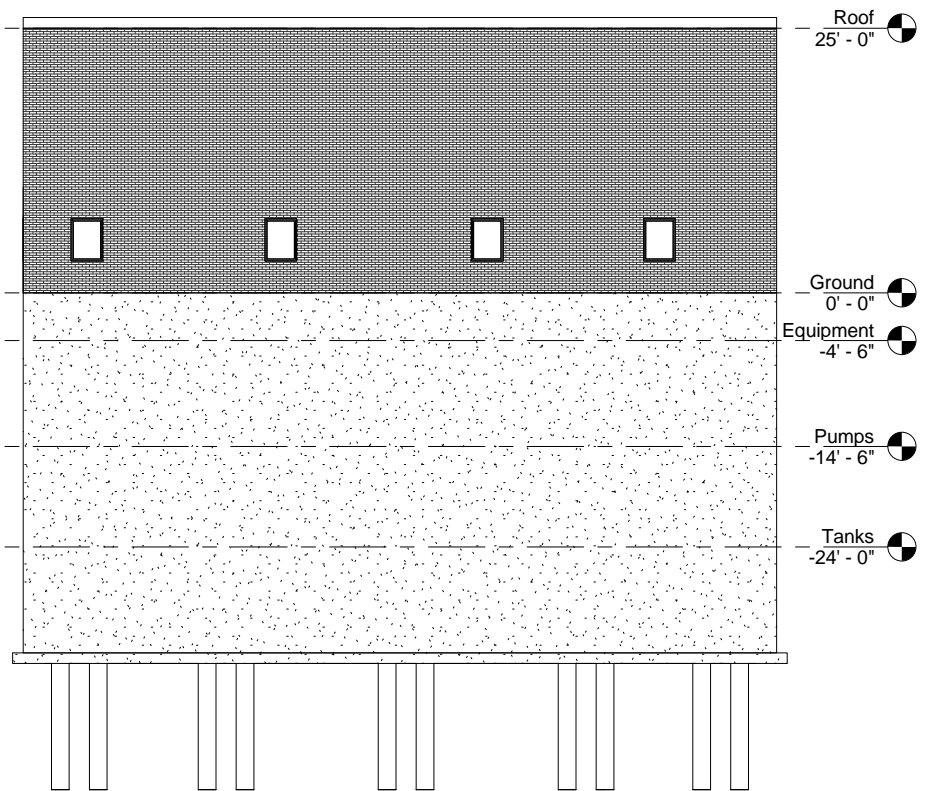
Title

Site Plan
Option 5



① East
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② North
3/32" = 1'-0"



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Option 5 Design
Septage Upgrade, Pease

No.	Description	Date

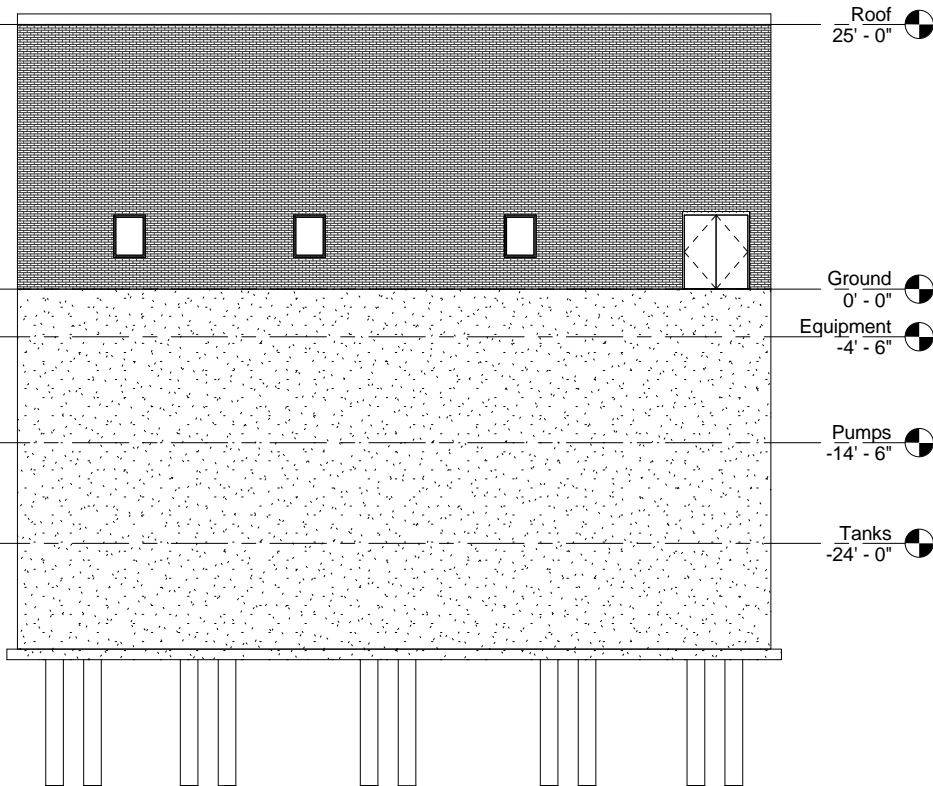
North & East Elevations

Project number MQP-SL1-STW6
Date March, 2016
Drawn by Author
Checked by Checker

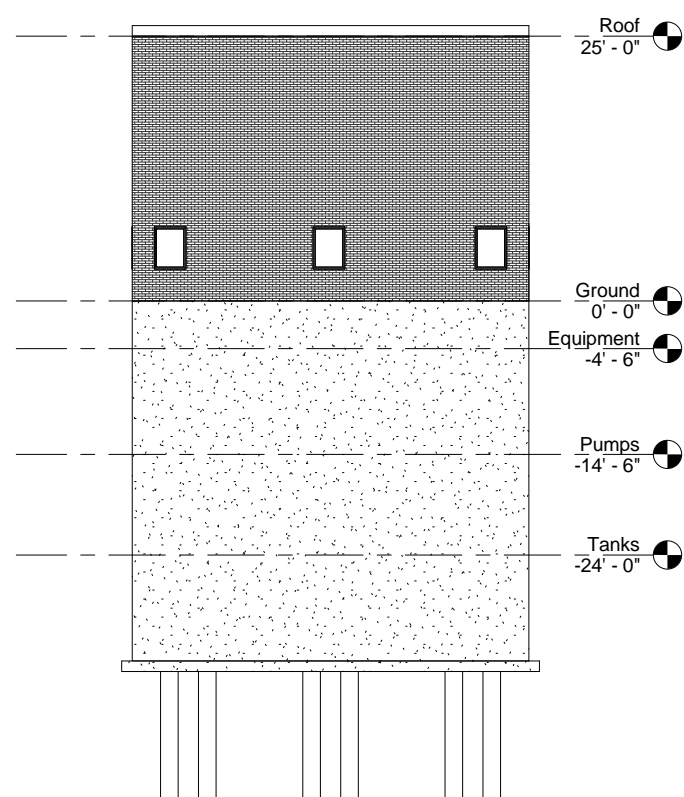
A101

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3/4/2016 6:44:06 AM



① South
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② West
3/32" = 1'-0"



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Option 5 Design Septage Upgrade, Pease

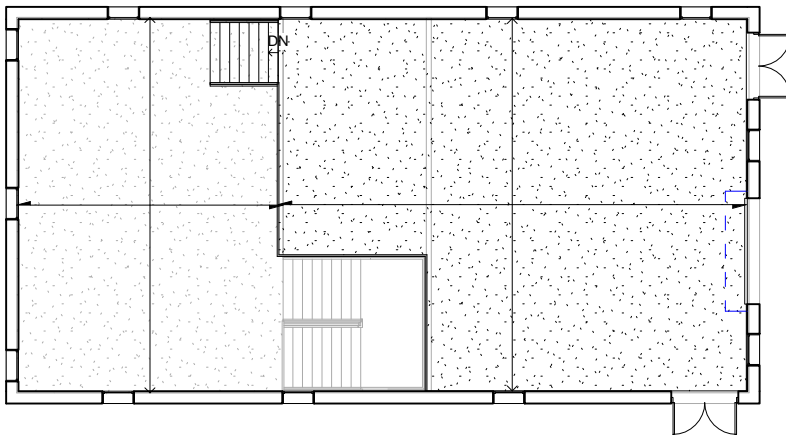
No.	Description	Date

South & West Elevations

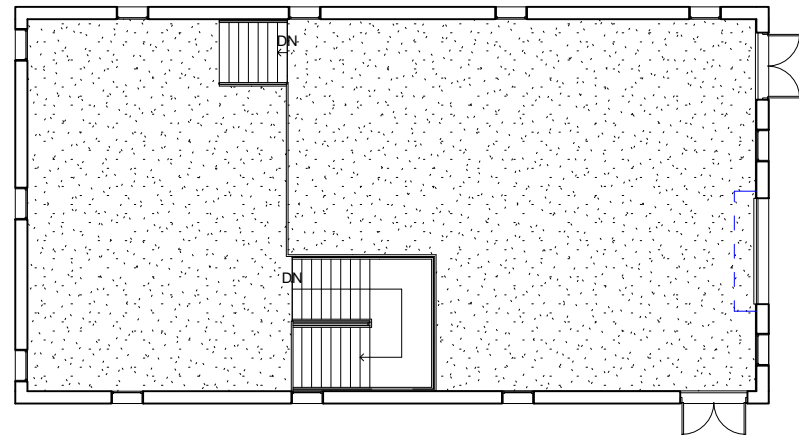
Project number	MQP-SL1-STW6
Date	March, 2016
Drawn by	Author
Checked by	Checker

A102

Scale 3/32" = 1'-0"



① Ground
3/32" = 1'-0"



② Equipment
3/32" = 1'-0"



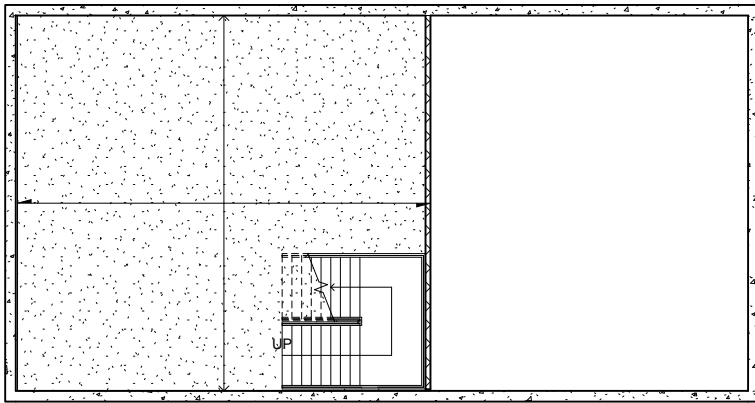
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Option 5 Design Septage Upgrade, Pease

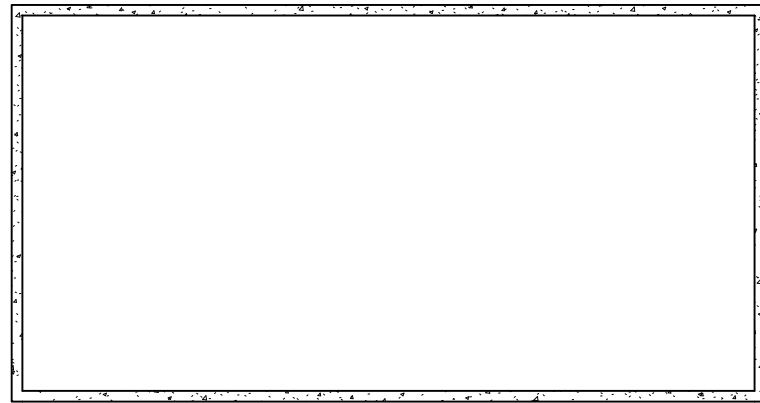
No.	Description	Date

Ground & Equipment Floor Plan

Project number	MQP-SL1-STW6	A103
Date	March, 2016	
Drawn by	Author	
Checked by	Checker	
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① Pumps
3/32" = 1'-0"



② Tanks
3/32" = 1'-0"



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Option 5 Design Septage Upgrade, Pease

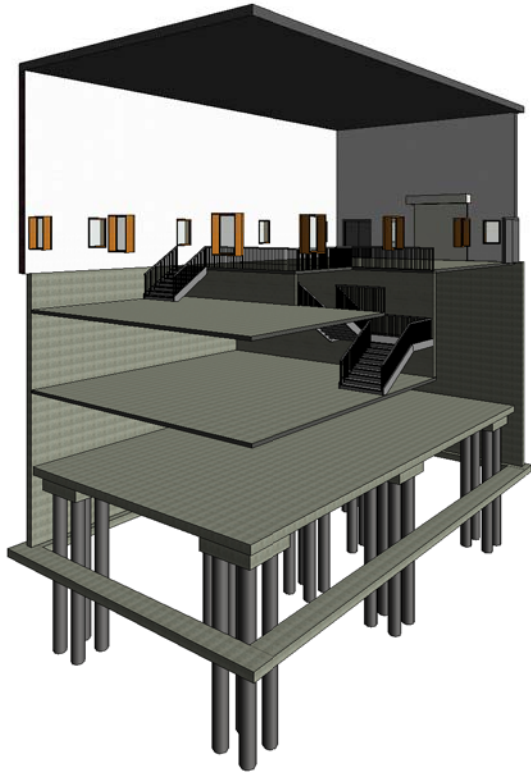
No.	Description	Date

Pumps & Tanks

Project number	MQP-SL1-STW6
Date	March, 2016
Drawn by	Author
Checked by	Checker

A104

Scale 3/32" = 1'-0"



① 3D View 1



② 3D View 2



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Option 5 Design Septage Upgrade, Pease

No.	Description	Date

3D Facility Views

Project number	MQP-SL1-STW6
Date	March, 2016
Drawn by	Author
Checked by	Checker

A105

Scale

ReceivingStation_EquipmentLayout.dwg
March, 2016
2016 WPI MQP

City of Portsmouth, NH

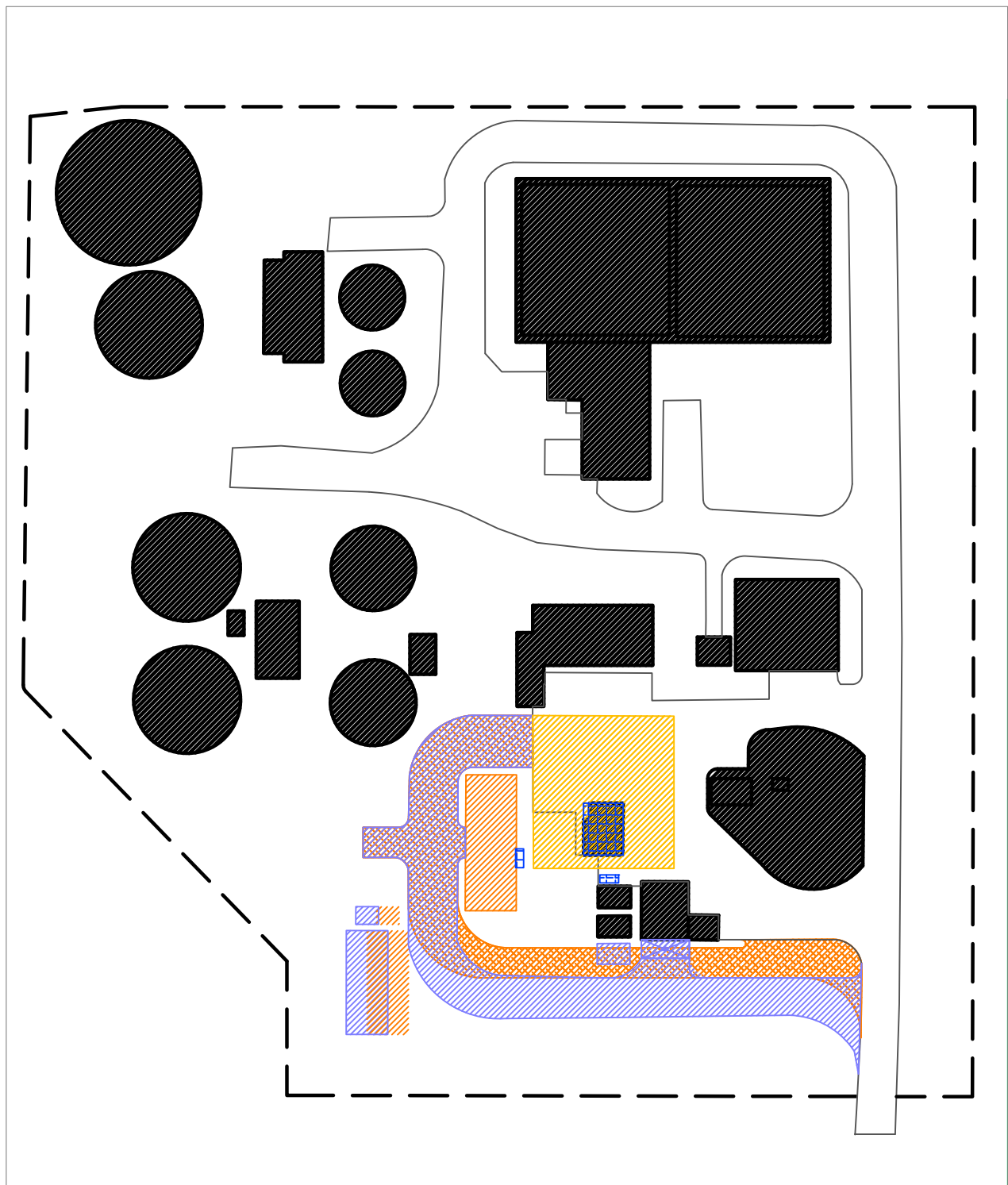
Pease WWTp

Figure No.

10

Title

Plan and Section Views



ORIGINAL SHEET - ANSI A

**NOT TO SCALE

Rec_ShortTerm.dwg
March, 2016
MQP-SL1-STW6



5 Burlington Woods
Burlington, MA 01803-4511
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Client/Project

City of Portsmouth
Septage Upgrade
Pease WWTP

Figure No.

1.0

Title

Reccomendation Site Plan
Design Options 2 and 3

Appendix G: Complete Cost Estimate

	Item	Unit Cost	Unit	Option1			Option2			Option3			Option4			Option5		
				Qty	Subtotal	Use	Qty	Subtotal	Use	Qty	Subtotal	Use	Qty	Subtotal	Use	Qty	Subtotal	Use
Gen. Req.	Mob/DeMob, Bonds, Insurance					\$22,200			\$28,400			\$2,800			\$4,460			\$93,200
Site Work	Ramp Construction	\$4,000	Each	0	\$0		1	\$4,000		0	\$0		0	\$0		0	\$0	
	Excavation	\$17	c.y.	0	\$0		60	\$1,020		0	\$0		60	\$1,020		120	\$2,040	
	Subtotal				\$0	\$0		\$5,020	\$5,000		\$0	\$0		\$1,020	\$1,000		\$2,040	\$2,000
Yard Piping	Cast Iron Piping	\$200	l.f.	0	\$0		30	\$6,000		0	\$0		0	\$0		370	\$74,000	
	Pipe Corrosion Resistance	\$3	l.f.	0	\$0		30	\$83		0	\$0		0	\$0		370	\$1,029	
	Cast Iron Fittings (4")	\$250	Each	0	\$0		10	\$2,500		0	\$0		0	\$0		9	\$2,250	
	Valves	\$1,000	Each	0	\$0		3	\$3,000		0	\$0		0	\$0		5	\$5,000	
	PVC Piping	\$20	l.f.	0	\$0		0	\$0		70	\$1,400		90	\$1,800		40	\$800	
	Subtotal				\$0	\$0		\$11,583	\$12,000		\$1,400	\$1,000		\$1,800	\$1,800		\$83,079	\$83,000
Conc.	Slab	\$750	c.y.	0	\$0	\$0	0	\$0	\$0	14	\$10,275	\$10,000	0	\$0	\$0	10	\$7,500	\$8,000
Build	Construction	\$300	s.f.	0	\$0	\$0	0	\$0	\$0	0	\$0	\$0	0	\$0	\$1,800	1200	\$360,000	\$360,000
Equipment	Storage Tank	\$3	gal	0	\$0		7500	\$22,500		0	\$0		7500	\$22,500		15000	\$45,000	
	50 gpm Pump	\$17,000	Each	2	\$34,000		2	\$34,000		0	\$0		0	\$0		2	\$34,000	
	150 gpm Pump	\$16,000	Each	0	\$0		0	\$0		0	\$0		0	\$0		2	\$32,000	
	520 UmAN/REL Pump (glycol)	\$8,000	Each	0	\$0		0	\$0		1	\$8,000		1	\$8,000		1	\$8,000	
	Variable Frequency Drive	\$3,000	Each	0	\$0		2	\$6,000		1	\$3,000		1	\$3,000		5	\$15,000	
	Septage Screening System	\$132,000	Each	1	\$132,000		1	\$132,000		0	\$0		0	\$0		0	\$0	
	Complete Plant	\$277,760	Each	0	\$0		0	\$0		0	\$0		0	\$0		1	\$277,760	
	Rock Trap	\$16,000		0	\$0		1	\$16,000		0	\$0		0	\$0		1	\$16,000	
	Dump Station Meter (DS-82)	\$50,000		1	\$50,000		1	\$50,000		0	\$0		0	\$0		1	\$50,000	
	Subtotal				\$216,000	\$216,000		\$260,500	\$261,000		\$11,000	\$11,000		\$33,500	\$34,000		\$477,760	\$478,000
Annual O&M	Tank Grit Removal	\$2,500	Each	2	\$5,000		2	\$5,000		2	\$5,000		2	\$5,000		0	\$0	
	50gpm Hose Replacement	\$810	Each	1	\$810		1	\$810		1	\$810		1	\$810		1	\$810	
	Subtotal				\$5,810	\$6,000		\$5,810	\$6,000		\$5,810	\$6,000		\$5,810	\$6,000		\$810	\$1,000
	Subtotal					\$244,200			\$312,400			\$30,800			\$49,060			\$1,025,200
	Contractor OH&P (18%)								\$56,232			\$5,544			\$8,831			\$184,536
	Contingency (30%)								\$93,720			\$9,240			\$14,718			\$307,560
	Total					\$244,200			\$462,352			\$45,584			\$72,609			\$1,517,296

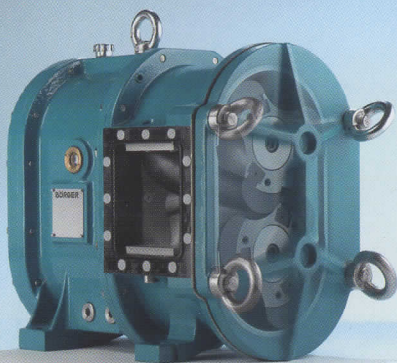
Appendix H: Selected Equipment Brochures and Quotes from Vendors

The Maher Corporation

BÖRGER®
Innovation

Simplicity

is Simply Better

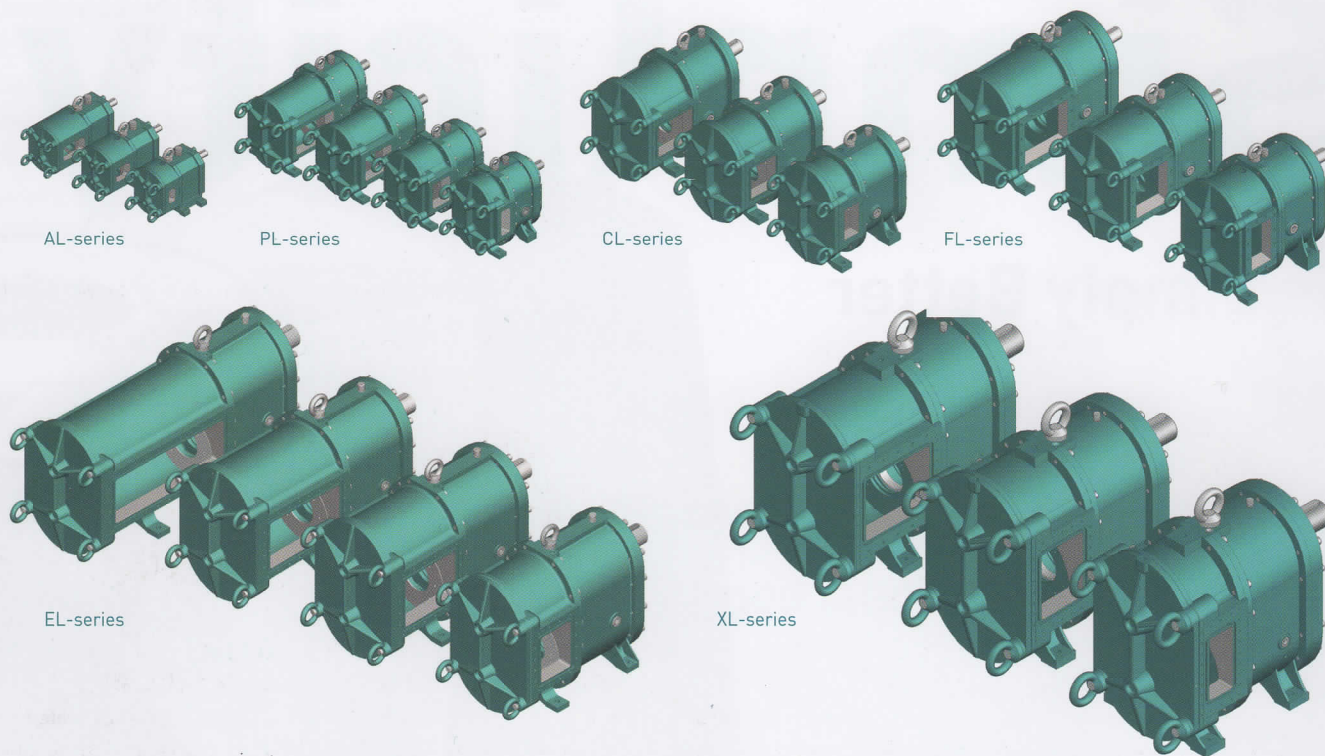


Rotary Lobe Pumps



Please add.

Six series with 20 sizes.



All pump models are manufactured using single piece construction. That won't be copied easily. The AL, PL, CL, FL, EL and XL series allow for a rated capacity between 5–5,000 usgpm. Whatever pump size is right for you depends on its intended purpose, installation location and the characteristics of the pumped fluid. Whatever you need, we'll give you thorough technical advice.

When we select a rotary lobe pump model for you, we consider the large variety of different pump sizes and materials available, including the best suited shaft seal and drive selection, so that your customized pump is built for its intended use. The pump casing is constructed using grey cast iron as standard. It is given either an abrasive-resistant coating or is finished entirely in stainless or duplex steel for corrosive applications.

All elastomers can be supplied in an almost unlimited material range with various characteristics. Our performance driven, reliable and robust pumps benefit not only from the Maintenance in Place Feature (MIP) but also from high efficiencies resulting in low energy consumption, reducing the life cycle costs to a minimum.

And now multiply.

Worldwide unique: the significant rotor variety.



Optimum Rotor*

Dual-lobe, screw profile

- large sealing area with effective scraping edge
- for abrasive and aggressive fluids
- almost pulsation-free and high pressure stability



Premium Rotor*

Dual-lobe, linear

- large sealing area and pressure stabile
- for high viscous, abrasive products
- from hard metal / stainless steel or plastics



Rotor

Dual-lobe, linear

- The Allrounder
- entirely elastomer coated
- for aggressive and abrasive fluids



Rotor*

Dual-lobe, readjustable

- entirely elastomer coated
- for abrasive conveying products
- threefold longer service life



Rotor*

Tri-lobe, screw profile

- with replaceable rotor tips
- for solids and debris containing fluids
- with low pulsation



Rotor*

Tri-lobe, linear

- with replaceable rotor tips
- with long-living sealing line
- for solids and debris containing fluids



Rotor

Tri-lobe, screw profile

- entirely elastomer coated
- with non-wetted core
- with low pulsation



Rotor

Tri-lobe, linear

- PTFE or Plastics coated
- for chemically problematic fluids
- solvents-resistant

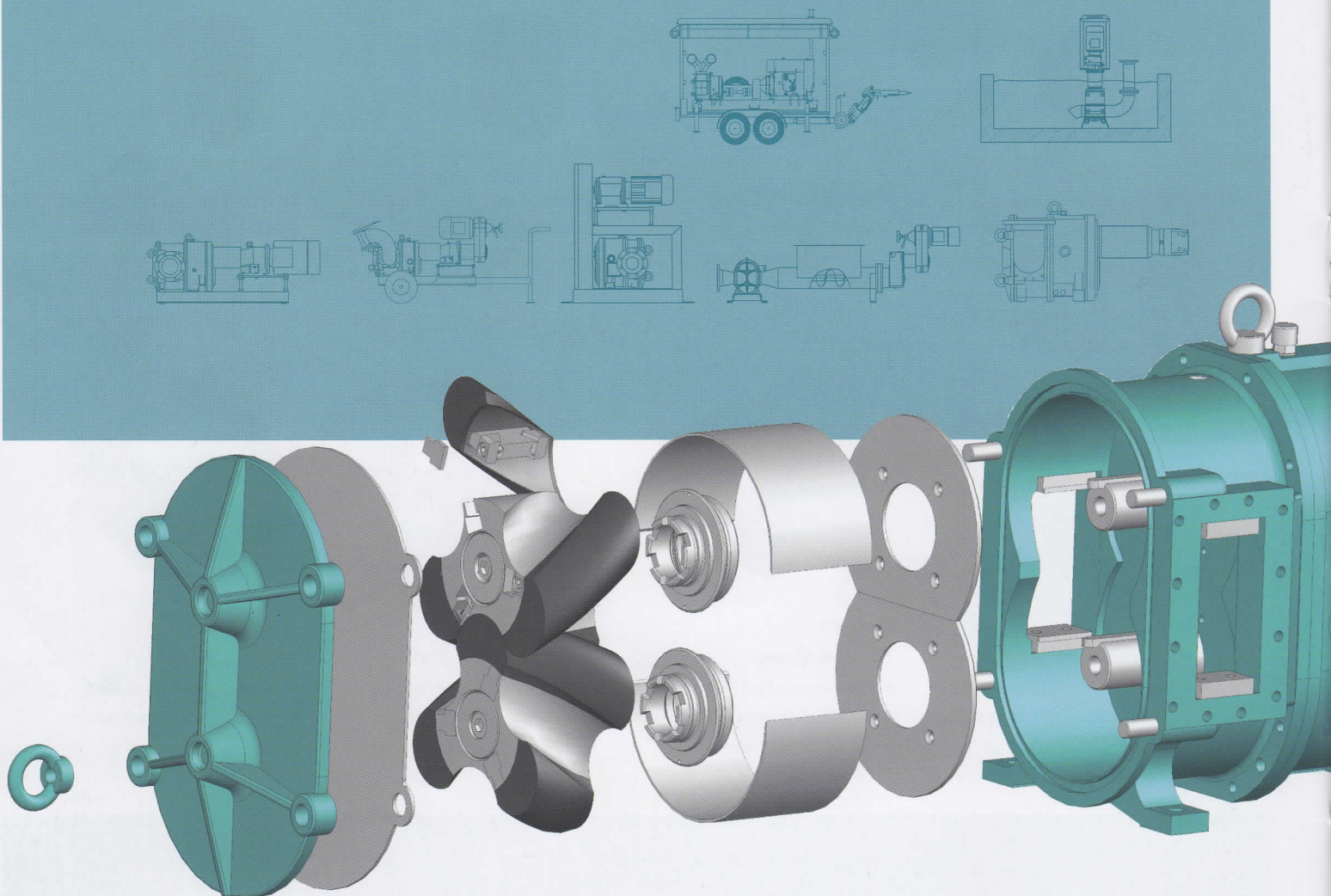
*patented

Different rotary lobe types with various materials of construction such as elastomer, plastic or metal are used depending on the fluid characteristics. Viscous, abrasive and aggressive pumped media can be handled easily with the variable and modular rotor design capabilities.

Thanks to the special, patented construction, the robust rotor core and durable shaft remain non-wetted. We consider all factors when determining the selection of the best suited rotor for each individual application, therefore meeting the special demands of our customers.

In case of changing operating conditions, different rotor designs can be fitted into an existing pump unit because of our modular pump design.

Construction, Drive and Assembly

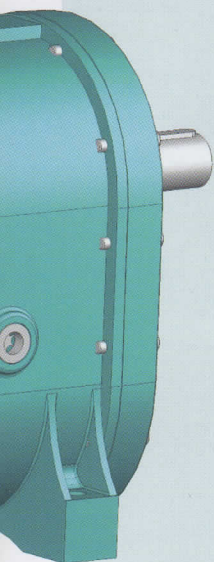


The low number and compact nature of the individual components will astonish anyone that has disassembled a Börger rotary lobe pump. The different sizes of the casings and rotors are manufactured in a single piece construction, quite different from the high number of components normally found in comparable pumps.

The result of course are robust and compact rotary lobe pumps, which are known for quiet, safe and reliable operation, long operational life and for ease of maintenance. The replacement of wear parts can be managed, in-situ, by service personnel in the blink of an eye without the removal of pipe systems or drive units. Simplicity is one of Börger's trademarks.

Börger rotary lobe pumps are universally mountable and are suited for many different types of installation. For example, electric, combustion and hydraulic drives are used. Complete mobile aggregates can be manufactured to customer specification and are finished in our own workshop.

Small Börger Rotary Lobe Pump Glossary



Block construction

Timing gear in a one-piece construction casing with a strong bearing and durable gear wheel pairing.

Compact construction

High performance in a compact design.

Interior pump protection

Protection plates available from a selection of hardened steel, stainless steel, plastic or ceramic.

Life cycle costs

For the customer, capital cost, energy consumption, maintenance and downtime as well as replacement part pricing levels compare excellently with all other positive displacement pumps.

MIP

Maintenance in Place: Replacement of wear parts in the blink of an eye, in-situ by service personnel. The way to go in the reduction of maintenance and downtime.

Pump casing

Made from high-quality grey cast iron, ductile iron, stainless steel or in duplex quality. Thanks to the MIP construction an almost limitless operational lifetime is achieved.

Quench

The quench and control liquid filled intermediate chamber, between the pump casing and the timing gear, provides a high degree of safety and is supplied by Börger as standard.

Quick-release cover

This is the entrance door to the interior of the pump and provides the quickest possible access to all parts in contact with the pumped medium.

Rotary Lobe Pumps

Self-priming, valveless positive displacement pumps guarantee almost pulsation-free and smooth flow patterns; reversible flow by switching the flow direction.

Rotor materials

Coatings to suit intended usage made from elastomers, plastic, all-metal including stainless steel.

Rotors

The patented rotors with quickly exchangeable rotor tips, elastomer coated or readjustable; screw profile design for almost pulsation-free pumping.

Shaft seal

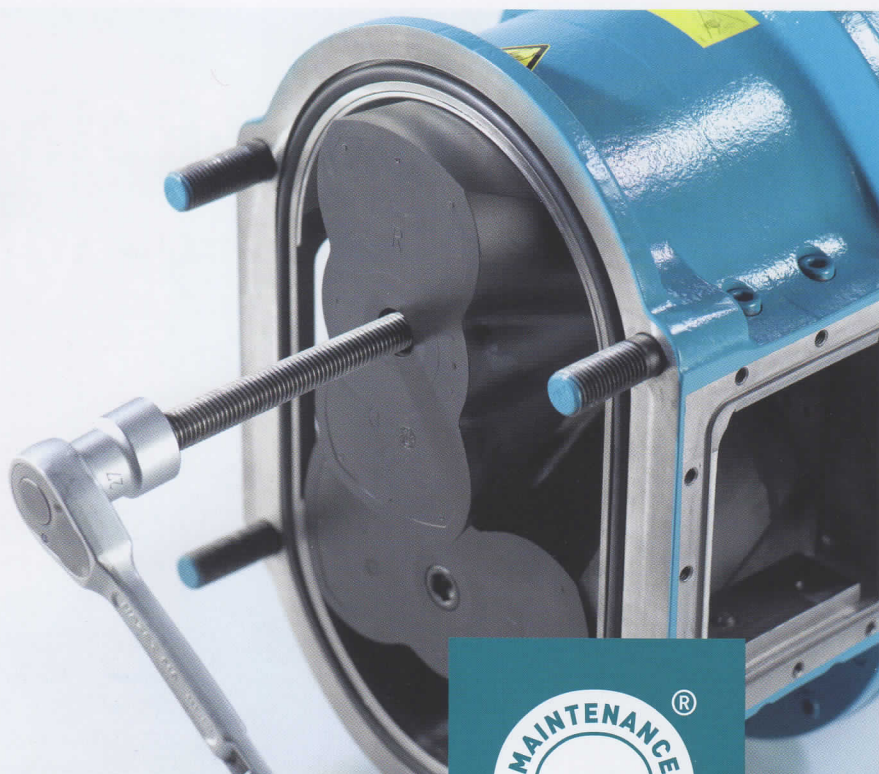
Supplied as standard with strong mechanical seal in different constructions and materials, optional with multi-seal or packing. The Börger Protect pump with double-acting mechanical seal is especially designed for pumping difficult and hazardous, often viscous media.

Smooth running

Large bucket geometry and short passage through the pump provide a smooth transfer of the pumped fluid.

BÖRGER®

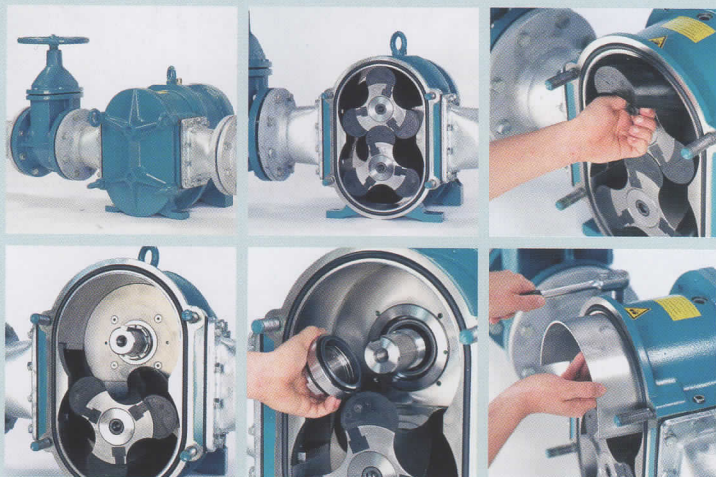
MIP = Maintenance in Place



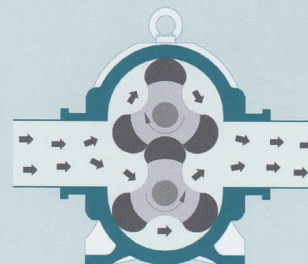
BÖRGER

Both, repair- and downtime cost money. Production and process time should not be lost due to maintenance. Following this basic principle, Börger has been constantly striving to perfect its rotary lobe pumps. The result is an extremely efficient, reliable and easy to maintain pump aggregate that is worldwide unmatched. All replacement and wear parts are extremely durable, resilient and

affordable. You won't be forced into any expensive maintenance contracts with Börger – simply carry out any maintenance and repairs yourself! The unique MIP property of our pumps makes this possible. MIP or Maintenance in Place means that all replaceable parts can be easily installed and removed by maintenance personnel, in-situ, without having to remove any pipe or drive systems.



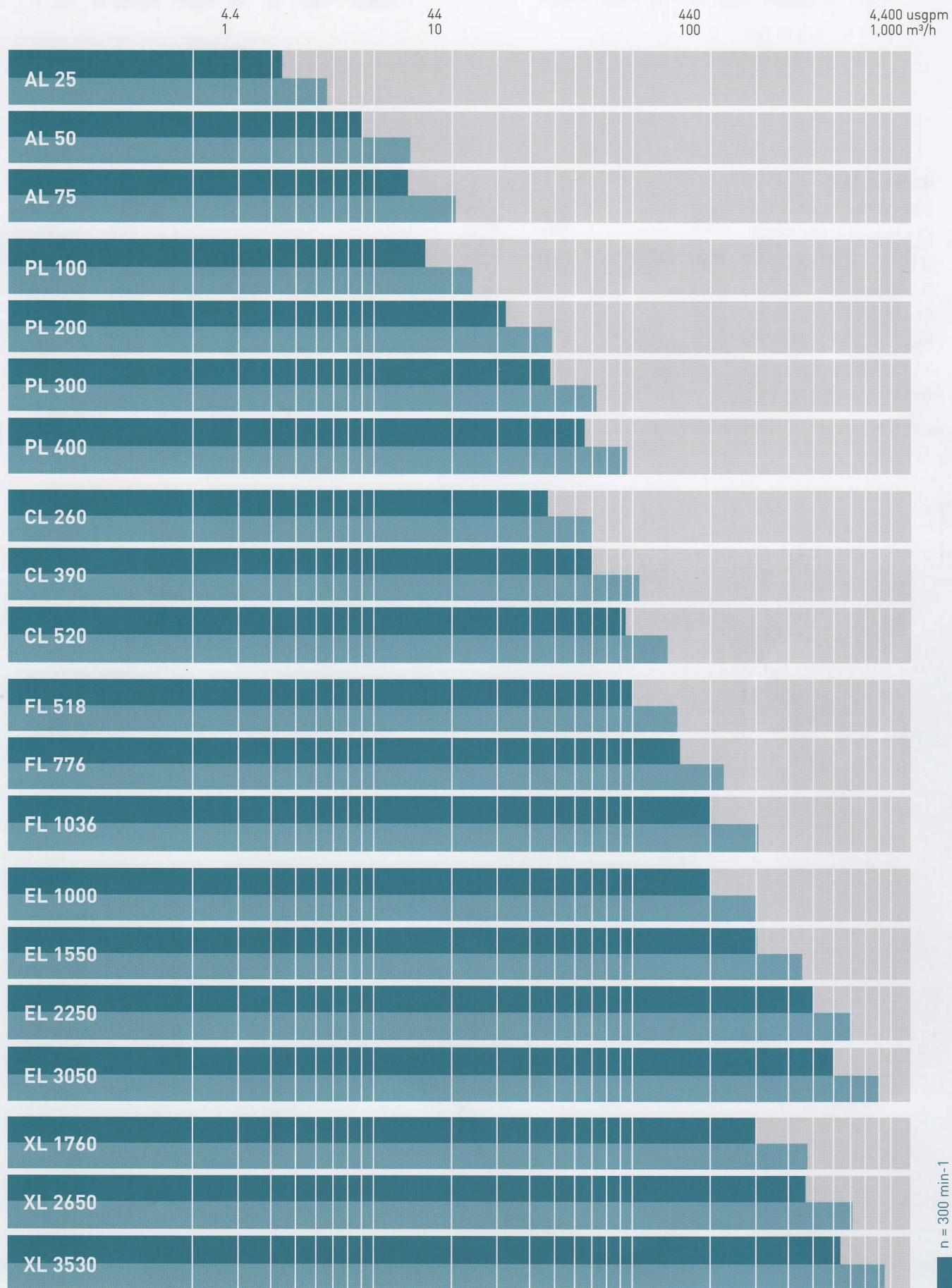
The quick-release cover enables easy access to the inner components of the pump. All wetted parts can be quickly maintained and replaced when necessary – without removal of pipe or drive system.



Reversible flow direction

Rotary lobe pumps are self-priming, valveless positive displacement pumps. The screw rotor guarantees almost pulsation-free, smooth running. Reversible flow is achieved by simply switching the rotation direction. Rotary lobe pumps are therefore suitable for both loading and unloading applications.

Pump Output





Boerger, LLC

2860 Water Tower Place
Chanhassen, MN 55317
USA

Toll Free 877-726-3743

Phone 612-435-7300

Fax 612-435-7301

america@boerger.com

www.boerger.com

Represented by:
THE MAHER CORPORATION
192 PLEASANT STREET
ROCKLAND, MA 02370
1-800-456-2437

US_P4_DKP_0114

Industries, Application and Pumped Media

- Wastewater and biosolids processing
- Chemical, ceramic, pharmaceutical and oil industries
- Paints, coatings and synthetic materials
- Fats, oil, grease and soap
- Starch and sugar mills
- Liquid raw materials, i.e. latex
- Pulp and Paper
- Meat and fish processing
- Fruit and vegetable processing
- Renewable energy production
- Clay and lime, aggregate industry
- Marine, Shipyards, and disaster protection

The Maher Corporation
Paul Sussman
192 Pleasant St.
Rockland, MA 2370
USA

Quotation

No.: 30001671

Date: 02/09/2016

RFQ Reference	: Septage treatment components capstr	Outside Sales	: Pete Masson
RFQ Date	: 10:14 02/09/2016	E-Mail	: pma@boerger.com
Recipient	: Paul Sussman	Phone	: 612-435-7324
E-Mail	: psussman@themahercorp.com		
Phone	: (781) 421-2623	Inside Sales	: James Connell
		E-Mail	: jco@boerger.com
Customer No.	: 100425	Phone	: 612-435-7335
Payment Terms	: Net 30	Fax	: 612-435-7301
Std. Delivery ARO	: 10Week(s)		
	Inquire For Faster Delivery	Prepared By	: JKCFHJ
Shipping Type	: UPS Ground	Price Firm Until	: 05/09/2016
Terms of Delivery	: FOB (Free On Board Factory) /FOB		

Line	Part / Label	Quantity	Unit Price	Total Price
------	--------------	----------	------------	-------------

Conveying Product

Product: Sludge
Specific Product: -
Viscosity: 1 cp
Solid Content: 5 %
Solid Size: - in
Density/SG: 1.0 -
Product Temp.: Ambient °F
ph-value: Neutral
Addl Notes:

Operational Characteristics

Location: Closed Building, Dry
Specific Location: -
Hazardous Area: Not Classified
Ambient Temp.: Ambient °F
Operating Mode: Continuous -
Suction Pressure: Flooded psi
Discharge Pressure: - psi
Differ. Pressure: - psi
NPSHa: - ft
Addl Notes:

Performance Data

	<u>GPM</u>	<u>PSI</u>	<u>RPM</u>
Min. Capacity:	-	-	-
Nom. Capacity:	50	20	245
Max. Capacity:	-	-	-

Additional Notes

1.00	7510000003 PL 100 Assembly	1
1.05	PP1SARCFAAAADCCC14 Börger Rotary Lobe Pump PL100 Product series: BLUEline	1

Quotation

No.: 30001671

Page: 2

Date: 02.09.2016

Line	Part / Label	Quantity	Unit Price	Total Price
	Version: Classic			
	Casing: One-piece Blockcasing from Grey Cast Iron ASTM A48-40 B with easily replaceable radial casing liners Axial casing protection liners from Hard Metal Radial casing protection liners from Hard Metal (MIP®)			
	Rotor geometry: Tri-lobe, entirely elastomer coated, screw form, for almost pulsation-free operation Rotor coating: Buna-N Nominal Solids Passing: 1.57" Displacement: 23.50 gal/100 rev			
	Shaft seal: Maintenance free single acting mechanical seals, with quench and quench level control Seal rings from Duronit V / Duronit V Dynamic O-rings: Buna-N Stationary O-Rings: Buna-N			
1.10	1300000066 PL100 to 2in ANSI Flange B1 Configuration Galvanized CS	2		
1.15	5310000399 Nord SK22-180TC-6.51 Inline Helical Reducer 1750rpm/269rpm	1		
1.20	5120000823 WEG 00318ET3E182TC-W22 3hp,1800rpm,Prem Eff 208-230/460V 182/4TC,1.25SF	1		
1.25	2500000002 PL In-Line Assembly <=20 HP Galvanized Frame Flexible Coupling & Guard Galvanized Gearmotor Plate	1		
PL100 Pump Assembly				\$ 8,773.24
- Optional Item(s) not Included -				
2.00	2900000003 Specified Spare Parts and Special Tools PL100	1	\$ 1,800.00	\$ 1,800.00
PL100 Spare Parts and Tools				\$ 1,800.00
- Optional Item(s) not Included -				

Quotation

No.: 30001671

Page: 3

Date: 02.09.2016

Line	Part / Label	Quantity	Unit Price	Total Price
	Net Value			\$ 10,573.24
	Tax	0.00%		
Total Amount (USD)				\$ 10,573.24

- Optional Item(s) not Included -

Notes:

1. BOERGER, LLC's standard Terms and Conditions apply and are an integral part of this quotation unless specifically noted otherwise in this proposal.
2. Installation, wiring, field painting, start-up and instructional services are not included unless specifically noted otherwise in this proposal.
3. Anchor bolts, pressure gauges, valves, drainage piping, starters, variable frequency drives and control equipment or any other items are not included unless specifically noted otherwise in this proposal.
4. BOERGER, LLC will review plans and specifications and will offer technical assistance and certified pump drawings for construction. The responsibility for pump station layout, access, seismic calculations including local PE stamp, etc., shall be by others.
5. This proposal is offered as an acceptable pumping system based upon descriptive items listed above. Deviations from the equipment described could result in price adjustment.
6. A BOERGER, LLC field engineer may be provided, as noted above, in a supervisory capacity only. Any and all costs associated with labor, set-up, etc., for the tests are to be by contractor.

Boerger, LLC
2860 Water Tower Place
Chanhassen, MN 55317
USA

Phone: 612.435.7300
Fax: 612.435.7301

E-Mail: america@boerger.com
Website: www.boerger.com

Section 1 Boerger Rotary Lobe Pumps

1.01 GENERAL

- A. The equipment covered by these Specifications shall be of standard units of proven ability as manufactured by reputable concerns having long experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed as shown on the Drawings.
- B. All equipment shall be designed and built for 24-hour continuous service at any and all points within the specified range of operation, without overheating, without cavitation, and without excessive vibration or strain.
- C. The pumping units required under this section shall be complete. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially adapted for the service to be performed. Ample room for inspection, repairs and adjustment shall be provided.
- D. Stainless steel nameplates giving the name of the MANUFACTURER, the pump serial number and material code and all other pertinent data shall be attached to each pump, motor, and control panel.
- E. All working parts of the pumps and motors, such as bearings, wearing rings, shaft, sleeves, etc., shall be standard dimensions built to limit gauges or formed to templates, such that parts will be interchangeable between like units and such that the OWNER may, at any time in the future, obtain replacement and repair parts for those furnished in the original machines.
- F. The nameplate ratings of the motors shall not be exceeded, nor shall the design service factor be reduced when the pump is operating at any point on its characteristic curve at maximum speed.
- G. Mechanical equipment, including drives and electric motors shall be supplied and installed in accordance with applicable OSHA regulations. The noise level of motors, unless otherwise noted, shall not exceed 85 dBA measured 3 meters from the unit under free field conditions while operating on utility power.
- H. All lubrication fitting shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housings, or guards.
- I. Warranty: Rotary Lobe Pumps supplied under this section shall be warranted to be free from defects in workmanship, design and materials for a period of two (2) years from shipment. If any part of the equipment should prove to be defective during the warranty period, the MANUFACTURER at no expense to the OWNER shall replace the part.

1.02 PUMPS

A. General

1. The Rotary Lobe Pumps shall be designed to be abrasion resistant for applications in wastewater treatment plants. The pump shall have a minimum displacement of 23.5 gal / 100 rev. (PL 100)
The ratio of the axial length of the lobe as compared to the lobe diameter (length/diameter) shall not exceed 1.0.
2. The pumps shall be of the positive displacement, rotary lobe type, designed to pump primary and secondary wastewater sludge as manufactured by Boerger.
3. All fluid-wetted parts including the mechanical seal shall be replaceable through the quick release front cover without disassembly of coupling, drive unit or the pipe system.
4. The pumps shall be designed to temporarily run dry and to operate in either direction. Oil-quench for protection of the mechanical seal is mandatory. Seal water flush systems are not acceptable.
5. The pumps shall be constructed with an oil-filled intermediate chamber between the pump casing and the gearbox with the following functions:
 - a. Oil-Quench (Lubrication and cooling) of the mechanical seals
 - b. Detection of seal failures
 - c. Buffer zone to the sealed timing gear
6. Oil drain of gearbox and intermediate chamber shall be easily accessible with side mounted drain screw. Oil drain under the pump is not acceptable.
7. The rotor/shaft connection shall be oil-lubricated fed by an intermediate chamber and shall not come in contact with the pumped fluid.

B. System and Fluid Conditions

Fluid Name	Septage
Solids Content	5%
Capacity	50 gpm
Discharge Pressure	20 psi
Suction Condition	Flooded
Temperature	Ambient
pH Value	Neutral
Specific Gravity	1.0
Duty	Continuous

C. Pump Unit

Model	PL100
Drive Type	Geared Motor with Flexible Coupling
Drive Configuration	Inline
Motor Power	3 hp
Pump Speed	245 rpm
Suction Flange	2" ANSI 150-lb
Discharge Flange	2" ANSI 150-lb

D. Pump Construction

1. The pump casing shall be manufactured in a single block construction (Cast iron ASTM A48 grade 40, Brinell hardness 264 Brinell). Multiple Piece Design Pump Casings held together by screw connections are not acceptable.
2. The rear of the pump casing and the front cover shall be protected with replaceable wear plates with a hardness of 550 Brinell. The front cover protection plate shall be reversible. The pump casing shall be equipped with radial pump casing protection plates, which are less expensive and will eliminate the pump casing as a spare part for reduction of the Life Cycle Costs of the pump unit. Pump casings without radial liners are not acceptable.
3. The quick release cover shall be held in place by four eye nuts. The stationary threaded studs shall keep the front cover on the same level as the pump casing in the process of opening the pump for easy handling.
4. **PL Series**
Rotors shall be tri-lobe screw rotor design and shall consist of a non-sludge-wetted cast iron core entirely coated with abrasion-resistant Buna-N. Stacking of lobes is not acceptable. Rotors shall be keyed to the shaft and secured with one central screw to a cylindrical thread inside the shaft. The cast iron core of the rotor shall be equipped with a female thread to enable the removal of the rotor from the shaft with ease. Rotor/shaft designs with a cover disc and/or spring washers are not acceptable.
5. The shafts shall be non-sludge-wetted. The rotor/shaft connection shall be lubricated with quench fluid of the intermediate chamber. The shafts shall be timed in their rotation by straight cut timing gears running in a separate oil chamber, which also contains the ball and roller bearings for each shaft. Sludge wetted rotor/shaft connections are not acceptable. The shafts shall be constructed from AISI 4140 carbon steel.

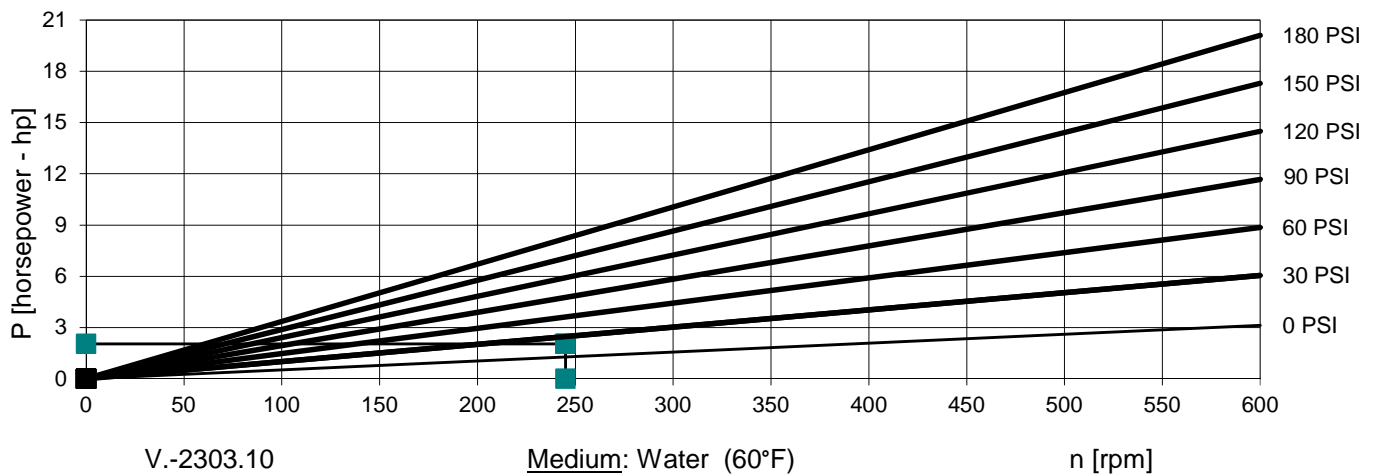
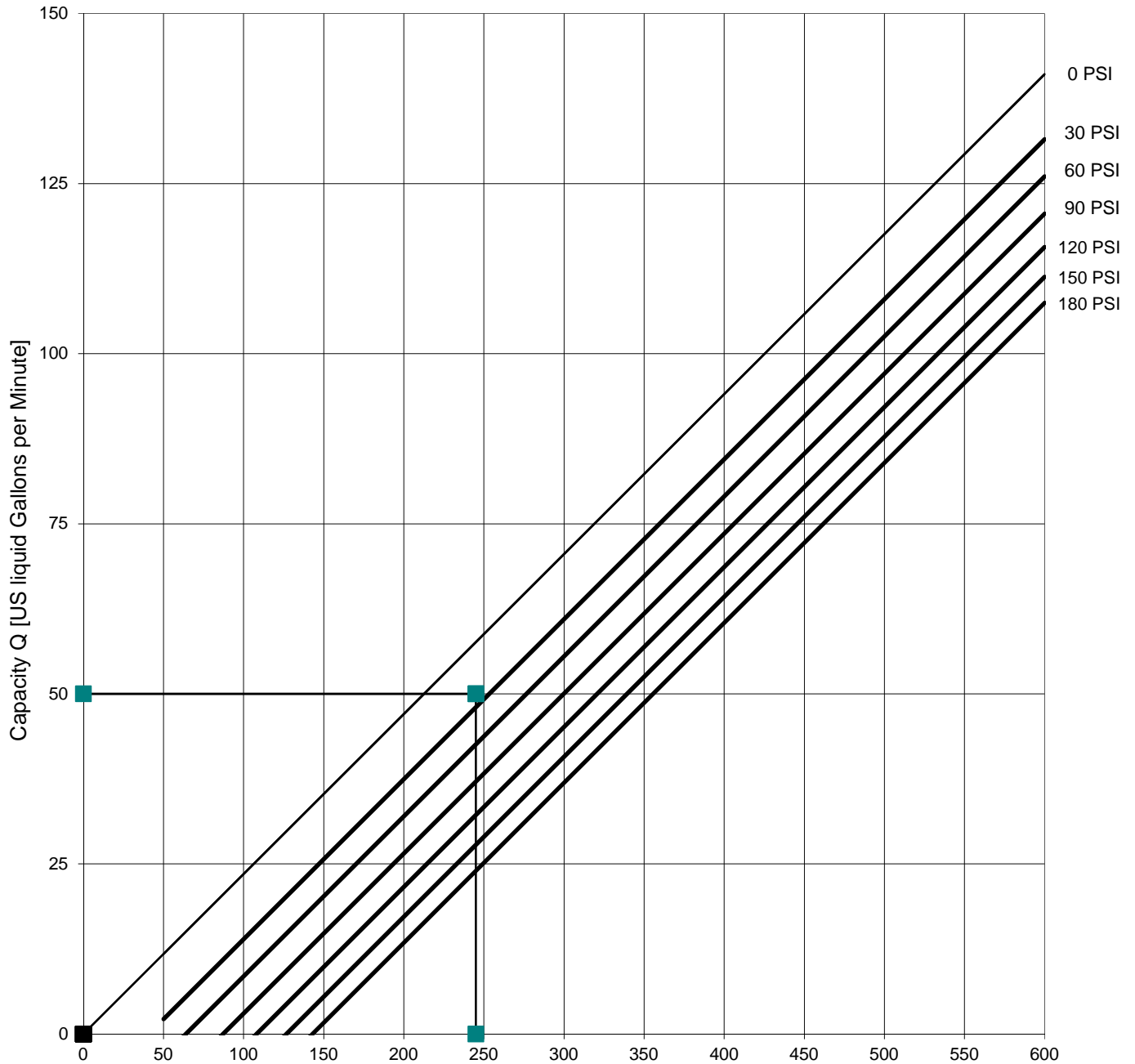
6. The pumps shall be fitted with maintenance free, quenched mechanical seals with duronit seal faces. The seals shall be operating in a common oil-filled intermediate chamber (Quench for lubrication and cooling). Purge systems for the seals are not acceptable. The rotating holding bush shall be locked in a fixed radial position by a keyway that also holds the rotor in place. Seal designs that open during rotor replacement are not acceptable. No sleeves shall be necessary for the mechanical seal set up. Design of the pump shall allow removal and replacement of the seal via the front cover.
7. Bearings and timing gear shall be located in a common oil-filled cast iron gearbox, fitted with a built in sight glass to monitor oil level. The timing gear shall maintain non-contact between the rotors. Bearing life to be designed for L-10 bearing life rating of 100,000 hours at design conditions.
8. Suction and discharge connections from galvanized steel shall be ANSI 150-lb flanges.
9. Pump and drive fitted on common base, made from galvanized steel.

1.03 Spare Parts

- A. One (1) set of mechanical seals and o-rings for each pump model
- B. One (1) set of lobes and o-rings for each pump model
- C. One (1) set of axial protection plates for each pump model
- D. One (1) set of radial liners (if provided) for each pump model
- E. One (1) set of special tools for each pump model

1.04 Motors

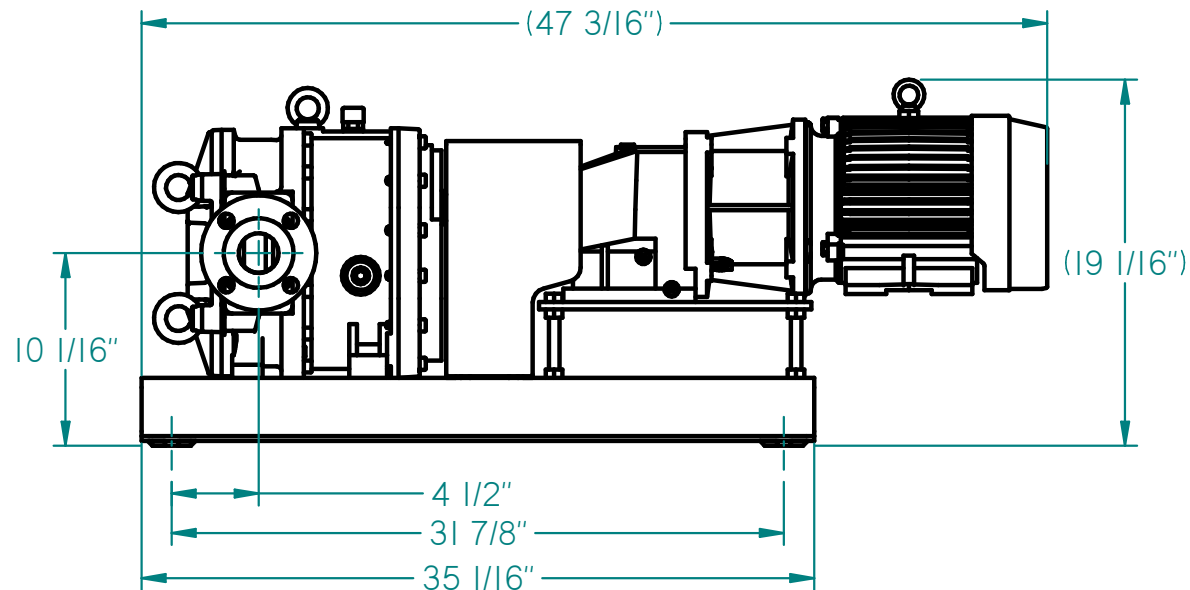
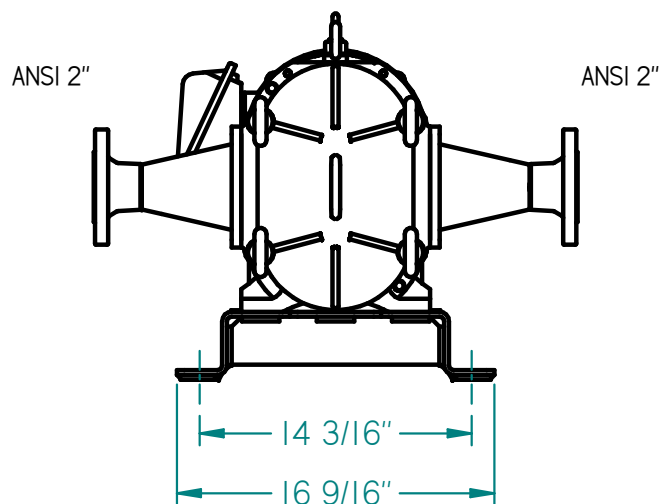
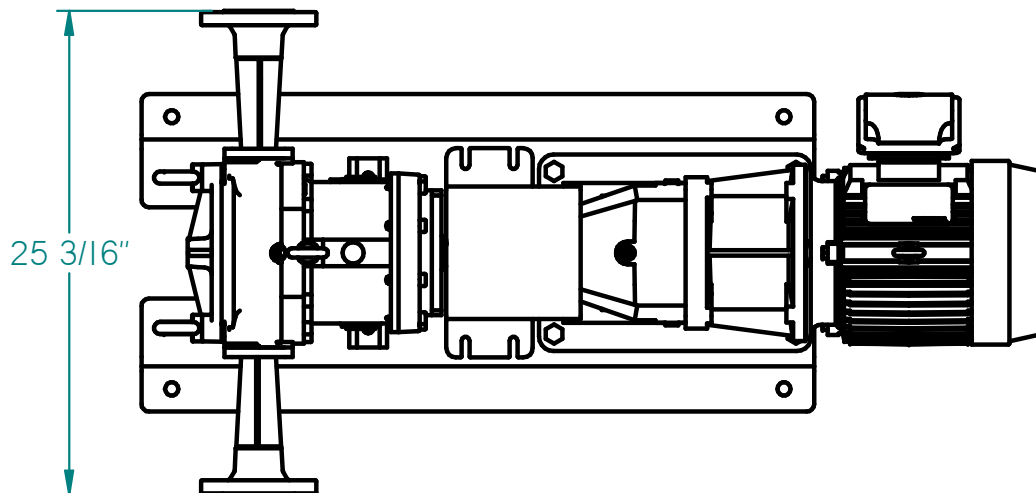
- A. Each unit shall consist of a pump with a gear reducer and 1800 rpm electric motor.
- B. The motor shall be 3-phase, 60 Hz, 460 V with 1.15 SF and Class F Insulation.
- C. All motors shall be built in accordance with latest NEMA, IEEE, ANSI and AFBMA standards where applicable.



V.-2303.10

Medium: Water (60°F)

n [rpm]



PROPRIETARY AND CONFIDENTIAL

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BOERGER, LLC

2860 Water Tower Place
Chanhassen, MN 55317
TEL: 612-435-7300
FAX: 612-435-7301



THIRD-ANGLE PROJECTION

BÖRGER.

TITLE:

PUMP: PL 100
GEAR: SK22-180TC
POWER: 3 HP

ALL DIMENSIONS IN INCHES
UNLESS OTHERWISE NOTED

DRAWN	NAME	DATE
dbuvarp		07/16/13

CHECKED	
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SIZE
A

DWG. NO.

PI03TN12FF21IN-U0

REV
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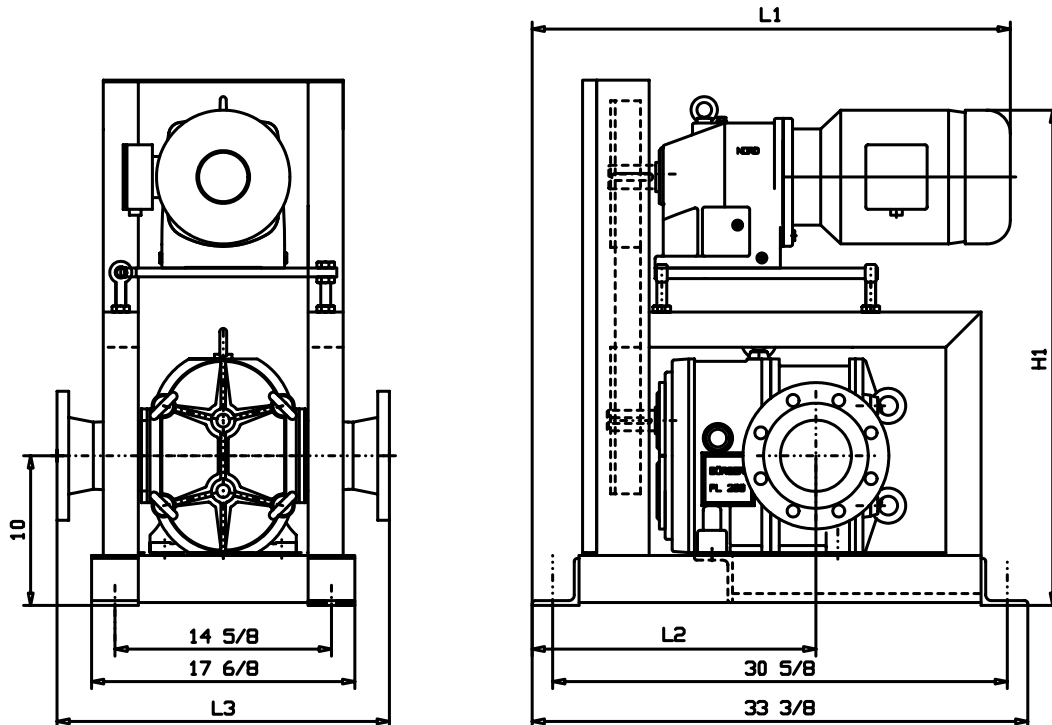
REV	DESCRIPTION	DATE	APPROVED
REVISION HISTORY			

DO NOT SCALE DRAWING

SHEET 1 OF 1

PL Series

Overhead Mounted Design



PL 100

Drive [HP]	Weight [lbs]	Measurements **			
		L1 [inches]	L2 [inches]	L3 [inches]	H1 [inches]
3	387	27 3/4	17 3/4	23 1/4	32 7/8
5	461	28 3/4	17 3/4	23 1/4	33 1/4
7 1/2	485	31	17 3/4	23 1/4	33 1/4
10	594	32 3/4	17 3/4	23 1/4	34 3/8

NOTE: standard flange; 3" (other flange connections possible)

** reference dimensions, dependent on flange size and motor / reducer type

PL 200

Drive [HP]	Weight [lbs]	Measurements **			
		L1 [inches]	L2 [inches]	L3 [inches]	H1 [inches]
5	497	28 3/4	19 1/8	22 3/4	33 1/4
7 1/2	521	31	19 1/8	22 3/4	33 1/4
10	582	32 3/4	19 1/8	22 3/4	34 3/8

NOTE: standard flange; 4" (other flange connections possible)

** reference dimensions, dependent on flange size and motor / reducer type

PL 300

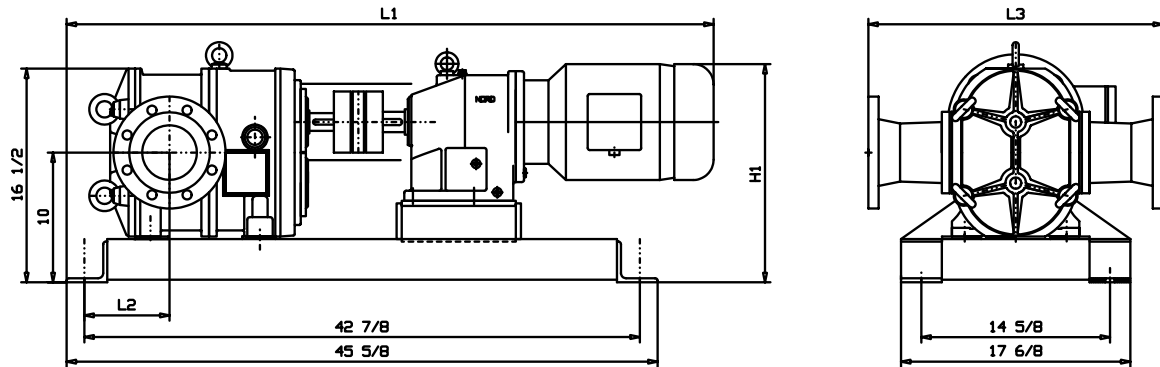
Drive [HP]	Weight [lbs]	Measurements **			
		L1 [inches]	L2 [inches]	L3 [inches]	H1 [inches]
5	534	28 3/4	20 1/8	27 5/8	33 1/4
7 1/2	558	31	20 1/8	27 5/8	33 1/4
10	667	32 3/4	20 1/8	27 5/8	34 3/8

NOTE: standard flange; 6" (other flange connections possible)

** reference dimensions, dependent on flange size and motor / reducer type

PL Series

Standard Design



PL 100

Drive	Weight	Measurements **			
[HP]	[lbs]	L1 [inches]	L2 [inches]	L3 [inches]	H1 [inches]
2	341	43 1/4	7 5/8	23 1/4	16 1/4
3	352	45 1/4	7 5/8	23 1/4	16 1/4
5	419	46 1/4	7 5/8	23 1/4	16 3/4
7 1/2	441	48 1/2	7 5/8	23 1/4	16 3/4
10	540	51	7 5/8	23 1/4	17 7/8
15	606	55 7/8	7 5/8	23 1/4	17 7/8
20	672	57 3/4	7 5/8	23 1/4	18 7/8

NOTE: standard flange; 3" (other flange connections possible)

** reference dimensions, dependent on flange size and motor / reducer type

PL 200

Drive	Weight	Measurements **			
[HP]	[lbs]	L1 [inches]	L2 [inches]	L3 [inches]	H1 [inches]
3	385	45 1/4	6 5/8	22 3/4	16 1/4
5	452	46 1/4	6 5/8	22 3/4	16 3/4
7 1/2	474	48 1/2	6 5/8	22 3/4	16 3/4
10	529	51	6 5/8	22 3/4	17 7/8
15	650	55 7/8	6 5/8	22 3/4	17 7/8
20	705	57 3/4	6 5/8	22 3/4	18 7/8

NOTE: standard flange; 4" (other flange connections possible)

** reference dimensions, dependent on flange size and motor / reducer type

PL 300

Drive	Weight	Measurements **			
[HP]	[lbs]	L1 [inches]	L2 [inches]	L3 [inches]	H1 [inches]
3	419	45 1/4	5 3/4	27 5/8	16 1/4
5	485	46 1/4	5 3/4	27 5/8	16 3/4
7 1/2	507	48 1/2	5 3/4	27 5/8	16 3/4
10	606	51	5 3/4	27 5/8	17 7/8
15	672	55 7/8	5 3/4	27 5/8	17 7/8
20	738	57 3/4	5 3/4	27 5/8	18 7/8

NOTE: standard flange; 6" (other flange connections possible)

** reference dimensions, dependent on flange size and motor / reducer type

Bredel 40 and Bredel 50 hose pumps

Bredel SERIES
Bredel Hose Pumps

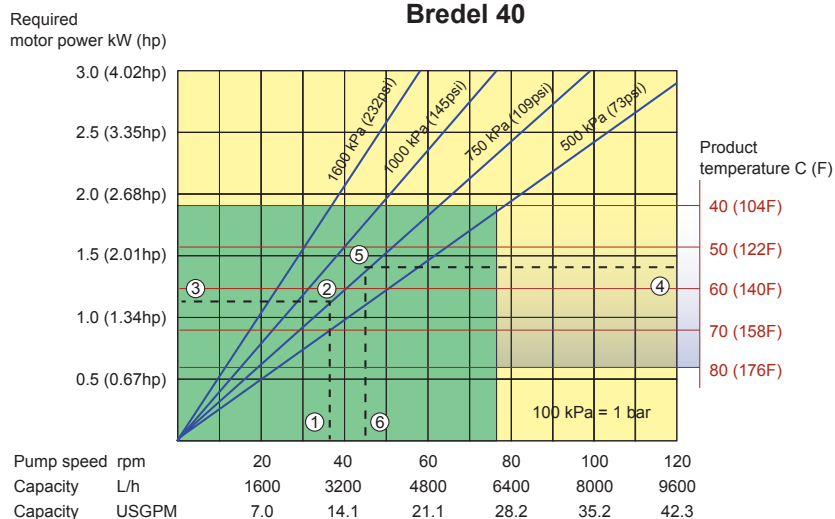
FEATURES AND BENEFITS

- Sealless, valveless pumping principle for reliable, low maintenance metering, dosing and transfer
- Flow rates up to 17,500 L/hr (77.1 GPM) and pressures up to 16 bar (232 psi)
- Dry running and self-priming, with up to 9.5 meters (30 foot) suction lift capability
- Robust design for aggressive chemicals or abrasives
- Compact direct coupled design to maximize gearbox life
- Simple hose change decreases cost of ownership, downtime and need for parts inventory



PERFORMANCE

Bredel 40



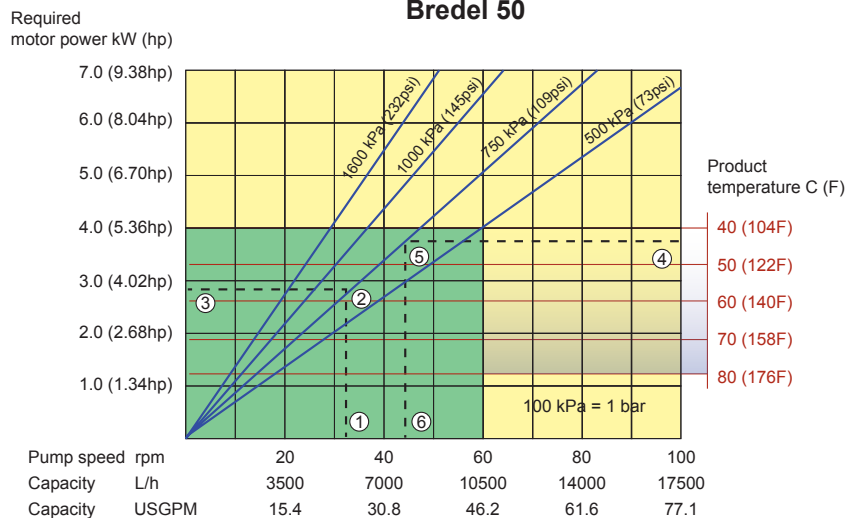
Continuous Duty

Intermittent Duty*

* Maximum 2 hours operation followed by minimum 1 hour stop

1. Flow required indicates pump speed
2. Calculated discharge pressure
3. Net motor power required
4. Product temperature
5. Calculated discharge pressure
6. Maximum recommended pump speed

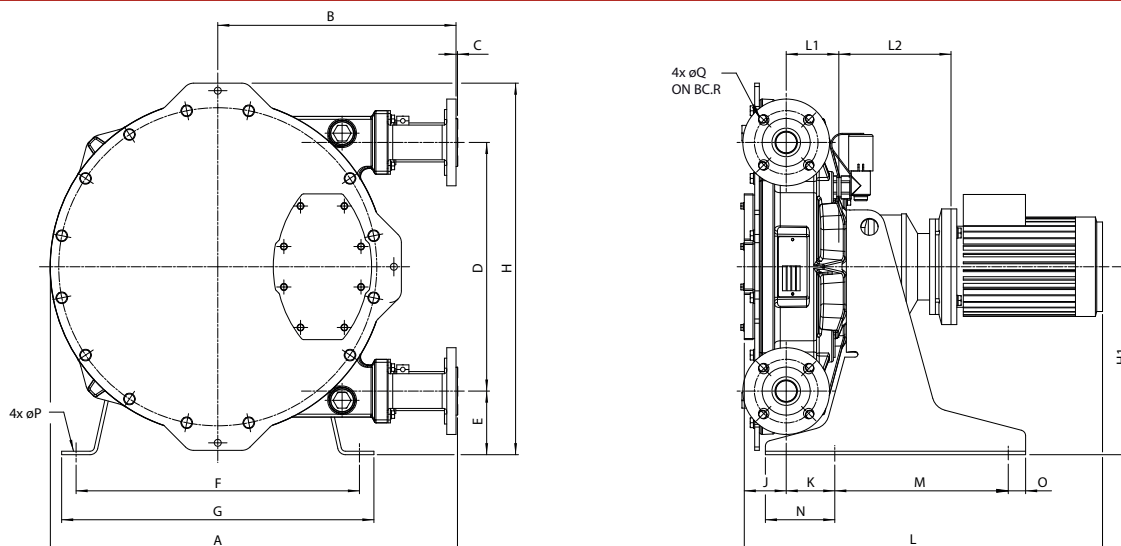
Bredel 50



Note: The area of continuous operation diminishes with increased product temperatures.

For product temperatures >40C (104F), the area of continuous operation is limited by the corresponding red temperature line.

DIMENSIONS



Type	A	B	C	D	E	F	G	H	H1	J	K	Lmax	L1	L2max	M	N	O	ØP	ØQ	R
Bredel 40 (mm)	705	412	2.5	430	110	490	540	643	325	73	84	906	91	301	300	120	30	18	18	110
Bredel 40 (inches)	27.8	16.2	0.09	16.9	4.3	19.3	21.3	25.3	12.8	2.9	3.3	35.7	3.6	11.9	11.8	4.7	1.2	0.71	0.71	4.3
Bredel 50 (mm)	838	475	3	554	143	620	680	811	420	84	95	975	112	339	380	155	40	18	18	125
Bredel 50 (inches)	32.9	18.7	0.12	21.8	5.6	24.4	26.8	31.9	16.5	3.3	3.7	38.4	4.4	13.3	15	6.1	1.6	0.71	0.71	4.9

TECHNICAL SPECIFICATIONS

	Bredel 40	Bredel 50
Flow range	up to 9,600 L/hr (42.27 GPM)	up to 17,500 L/hr (77.05 GPM)
Capacity	1.33 L/rev (0.35 G/rev)	2.92 L/rev (0.77 G/rev)
Minimum starting torque	320Nm (2,832 inch-lbs)	620Nm (5,487 inch-lbs)
Hose lubricant required	5 liters (1.32 G)	10 liters (2.64 G)
Pumphead weight	121 kg (267 lbs)	227 kg (500 lbs)
Common features		
Max inlet pressure	2.5 bar abs (38 psi)	
Suction pressure	0.05 bar abs (0.73 psi)	
Maximum discharge pressure	1,600 kPa (16 bar) (232 psi)	
Product temperature range*	-10C up to 80C (14F up to 176F)	
Ambient temperature range**	-20C up to 45C (-4F up to 113F)	

*Please consult your BredeL representative for lower or higher temperature operation.

**Allowable ambient temperature is based on pump capabilities and may be further limited by gearbox ambient capabilities

MATERIALS OF CONSTRUCTION

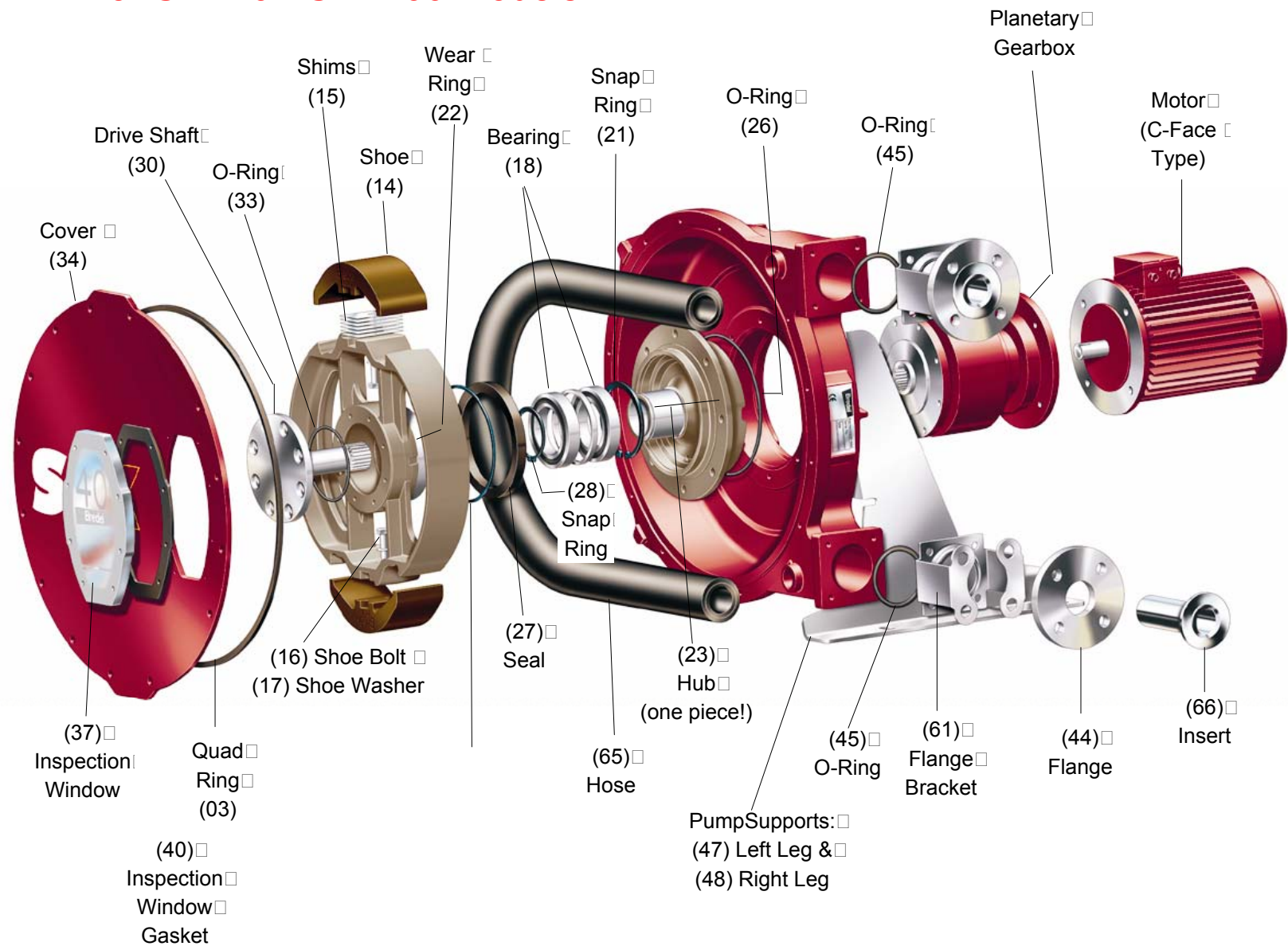
Components	Materials	Options	Features
Pump housing	Cast iron	Available hose materials	NR, NBR, F-NBR, EPDM, CSM
Rotor	Cast iron	Available flanges	ANSI, EN DIN, JIS
Pressing shoes	Aluminium or epoxy	Available inserts	Bredel standard or with sanitary connectors
Cover	Mild steel	High level float switch	Max. 2A, 230 V AC/DC, max. 40VA
Brackets	Galvanized steel or AISI 316	Low level float switch	ATEX: max. 50 mA, max. 28V AC/DC
Flanges	Galvanized steel or AISI 316	Integrated FI for stand alone speed control	Factory programmable from 12-80 Hz
Inserts	AISI 316, PVC, PP, PVDF	Revolution counter	For maintenance intervals and /or metering
Support frame	Galvanized steel or AISI 316	Vacuum assist	For difficult suction conditions and high viscosity fluids
Hose clamps	Galvanized steel or AISI 316	Cover lifting device	For one-man pump maintenance
Shaft	Alloy steel		
Seals	Neoprene or nitrile		

The information contained in this document is believed to be correct at the time of publication, but Watson-Marlow BredeL BV accepts no liability for any error it contains, and reserves the right to alter specifications without prior notice. All mentioned values in this document are values under controlled circumstances at our test bed. Actual flow rates achieved may vary because of changes in temperature, viscosity, inlet and discharge pressures and/or system configuration. APEX, DuCoNite®, Bioprene® and BredeL are registered trademarks.

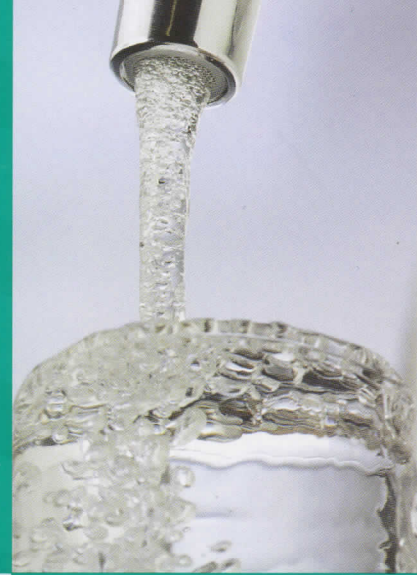
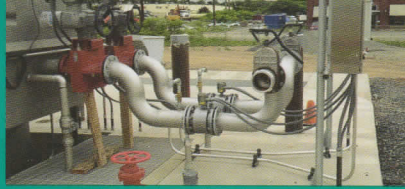
BredeL
Hose Pumps

wmpg.com
800-282-8823
support@wmpg.us

Watson-Marlow Bredele
Exploded Detailed 3-D view
for SPX40 - SPX100 Models



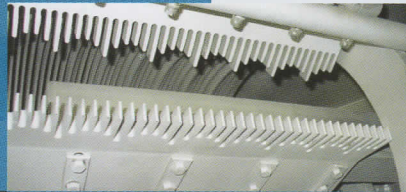
Raptor® Septage Acceptance Plant



For Municipal Wastewater,
Septage and Grease Trap
Applications



Cleaner Water for a Brighter Future®

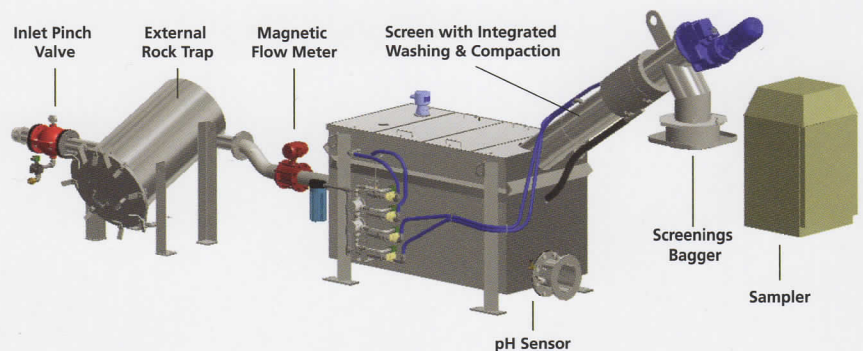


The Lakeside *Raptor*® Septage Acceptance Plant

Many wastewater treatment plants process municipal, industrial, and septic tank sludges that contain debris and inorganic solids such as hair, plastics, grease, and hygienic materials. However, if not addressed appropriately, this debris can damage downstream equipment by clogging pumps and valves, decreasing aeration effectiveness, and dewatering and filtering equipment and sludge digestion.

Engineers, owners, and private companies recognize Lakeside as the industry leader in the design of septage acceptance equipment.

The SAP is a pre-engineered, self-contained, fully automated unit that removes debris and inorganic solids that typically pass through a conventional bar screen. Anchored by the reliable, heavy-duty *Raptor*® Fine Screen, the SAP is a simple, efficient way to pre-treat the increasing amount of municipal, industrial, and septic tank sludges processed at wastewater treatment plants.



Large Capacity External Rock Trap

Raptor® Septage Acceptance Plant Diagram



Raptor® Acceptance Control System (RACS) (Cont.)

The RACS is an optional feature of Lakeside Equipment Corporation's **Raptor Septage Acceptance Plant** that provides security access, load management, and invoicing capabilities.

Hauler Access, Invoicing and Data Acquisition

Plant administrators can create and manage customer and truck account information; control sampling and access on a truck-by-truck basis; track the number and sizes of loads for each hauler; and assign PIN numbers from the office. Non-proprietary data format with no license fees.

Allen-Bradley Programmable Logic Controller

Built-in Ethernet communications enable the RACS hauler station to work directly with an inlet flow control valve and magnetic flow meter to allow access/record unloading of each authorized hauler.

Allen-Bradley PanelView Plus Operator Interface

Haulers receive access by a plant-assigned PIN number that activates the system, opens the inlet flow control valve, and allows the hauler to select one of five waste types on a touch screen. A magnetic card swipe or a key switch (with or without PIN) is also offered. A credit card access system with PIN number can be provided in lieu of an owner billing system.

Data Storage and Retrieval

The RACS touch screen makes data accessible via an Ethernet communications interface. A USB data port is standard for use with a removable flash drive. Comma Separated Variable (CSV) files can be viewed with most spreadsheet or database software.

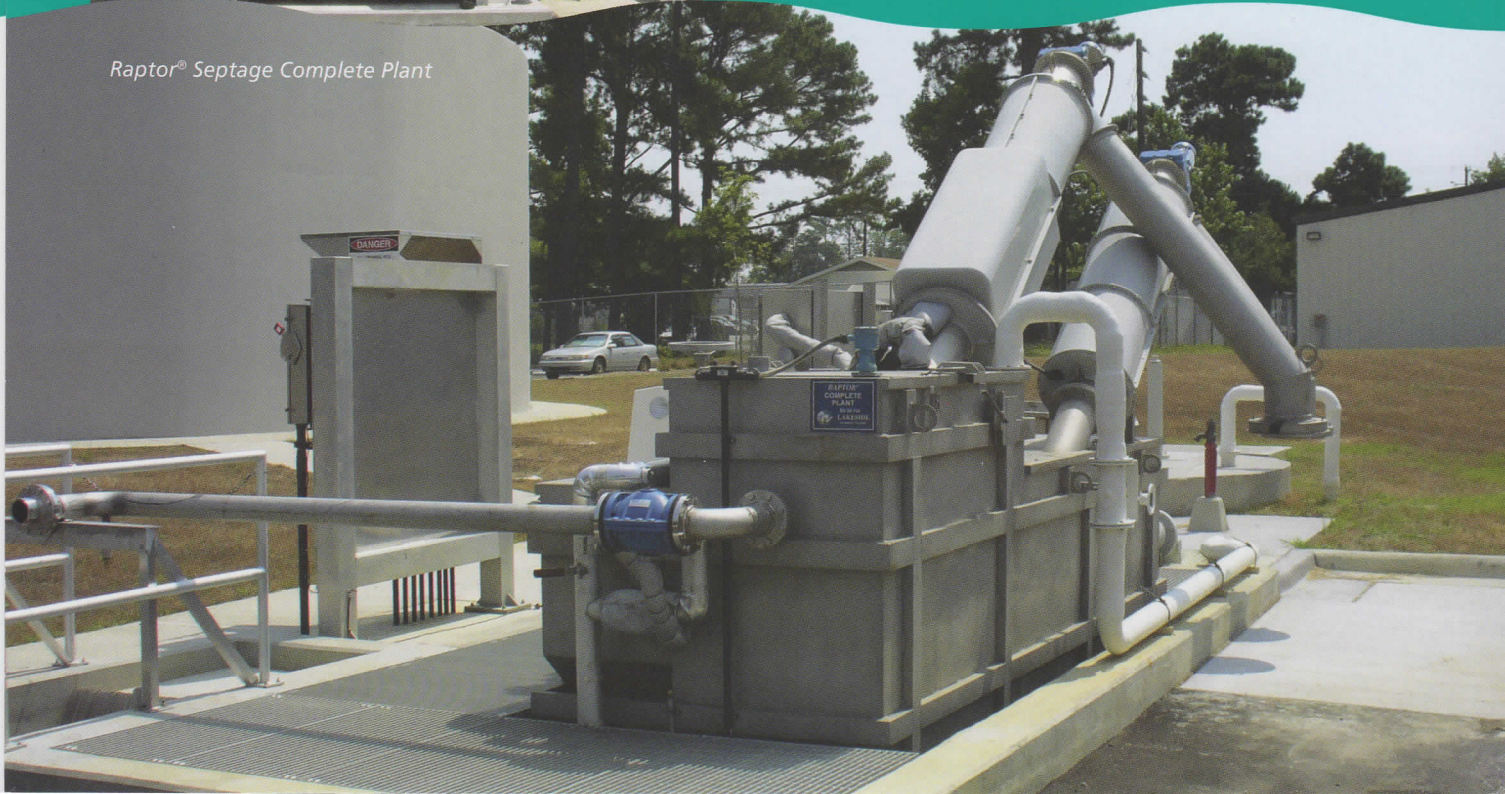
Printer

The septage hauler receives a printout of the load details, including date, time, hauler name, waste type, total gallons uploaded, elapsed time for unloading and any faults incurred, if applicable.



*Weather
Protection
Package*

Raptor® Septage Complete Plant



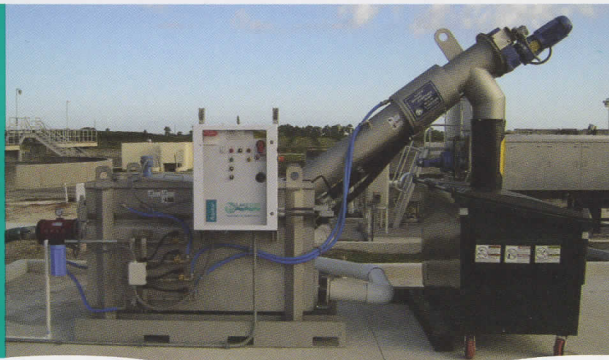
Operators rely on the Lakeside *Raptor*® Septage Acceptance Plant for minimal maintenance, advanced administrative features, and faster load processing that attracts more haulers, allowing the unit to pay for itself in a short time frame.

Standard Features of the Lakeside SAP Offer Instant Benefits

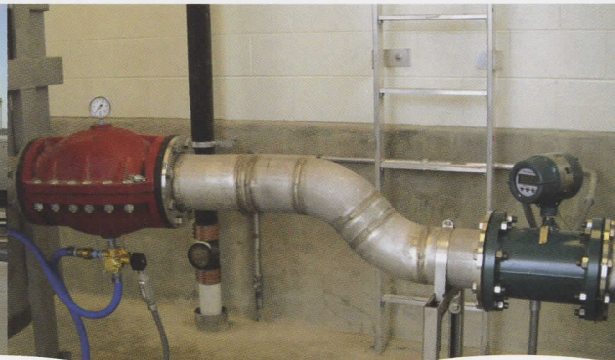
- Large capacity and rapid screen cleaning cycle process
- Pre-engineered to reduce design and installation costs
- Single motorized component, simple design, and easy operation improve reliability and reduce maintenance
- All AISI Type 304 stainless steel construction provides superior corrosion resistance
- Small footprint reduces total building volume and saves heating expenditures

- Reliable water-actuated pinch valve controls flow into the SAP
- Full-penetration rake head removes all captured debris/grease from the screen basket bars
- Two-stage washing feature lowers organic content/drier solids content
- Large compaction zone and 2 hp drive create a dry solid content of 40-50%, reducing screenings volume by 50% and weight by 67% for reduced disposal costs
- Contains septage, minimizes odors, and reduces insect and rodent attraction
- Pre-assembled, pre-wired, and pre-plumbed to enable one-day installation
- Integrated controls save design and installation costs

Skid-Mounted Designs



Magnetic Flow Meter

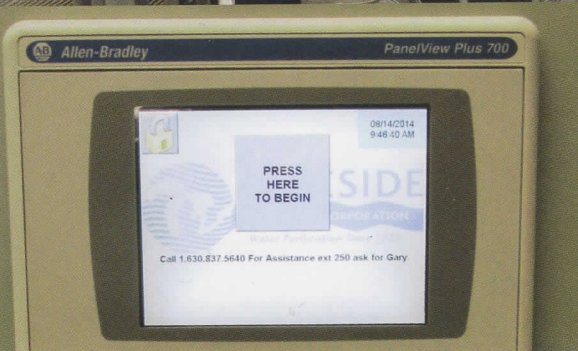


Optional Features Offer Even More Flexibility and Value

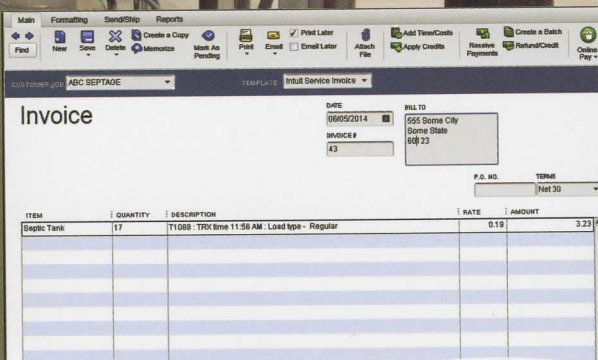
- AISI Type 316 stainless steel offers increased corrosion resistance for applications with chloride concentrations greater than 200 mg/L
- Explosion-proof enclosure that meets Class I/Division 1 or 2/Group D electrical environment
- Multiple inlets that allow operators to easily unload multiple tanker trucks at the same time
- Heat tracing, insulation, and protective cover for outdoor installations
- Individual bags or continuous hose bagger for odor control and to prevent re-hydration of screenings for outdoor installations

- Rock trap designs with 5 cubic feet of capacity to meet specific project requirements
- Magnetic flow meter that measures/totalizes flow from each septage tanker for billing purposes
- pH monitoring to detect septage outside the allowed pH range established by the plant
- Automatic sampling that allows owner to test each septage load
- Skid-mounted designs
- *Raptor*® Septage Complete Plant with screening, grit removal, and optional grease removal

Raptor® Acceptance Control System (RACS)



RACS Station for Security Access



Data Management and Invoicing

Management and Accounting System

A pre-configured personal computer periodically scans the RACS hauler station for new transactions and automatically enters them into an accounting system that permits customer tracking, invoicing and report generation. Plant personnel can manage hauler accounts and invoice septage haulers. The software package allows owner to:

- Receive data from up to ten RACS control stations
- Manage septage hauler identification information
- Generate reports and invoices and receive payments
- Record date, gallons and waste type for each load
- Permit entry of a minimum of five waste types and cost per gallon charges
- Import and export data
- Allow manual entry/import of load transactions

Treatment equipment and process solutions from Lakeside Equipment Corporation

Lakeside offers a wide range of equipment and systems for virtually all stages of wastewater treatment from influent through final discharge. Each process and equipment item that we supply is manufactured with one goal: to reliably improve the quality of our water resources in the most cost-effective way. We have been doing just that since 1928.

Screw Pumps

- Open Screw Pumps
- Enclosed Screw Pumps

Raptor® Screening Products

- Fine Screen
- Micro Strainer
- Rotating Drum Screen
- Wash Press

Trash and Screen Rakes

- Hydronic Type T Series
- Hydronic Type K Series
- Multi-functional Series
- Horizontal Series
- Catronic Series
- Monorail Series
- HY-TEC Screen

Package Headworks Systems

- Raptor®* Complete Plant
- H-Pac®*

Grit Collection

- SpiraGrit
- Aeroductor
- Inline Grit Collector
- Raptor®* Grit Washer
- Model L Grit Classifier
- Type W Grit Classifier

Filtration and Clarification

- Spiraflo Clarifier
- Spiravac Clarifier
- Full Surface Skimming
- MicroStar® Filter

Biological Treatment Solutions

- CLR Process
- Process Monitoring & Control Systems
- Magna Rotors
- Velocity Control Baffles
- Rotor Covers
- Level Control Weirs
- BioJet™ Surface Aerator
- Sequencing Batch Reactors
- Package Treatment Plants
- Low Speed Mixers
- Medium Speed Mixers
- Recirculation Pumps

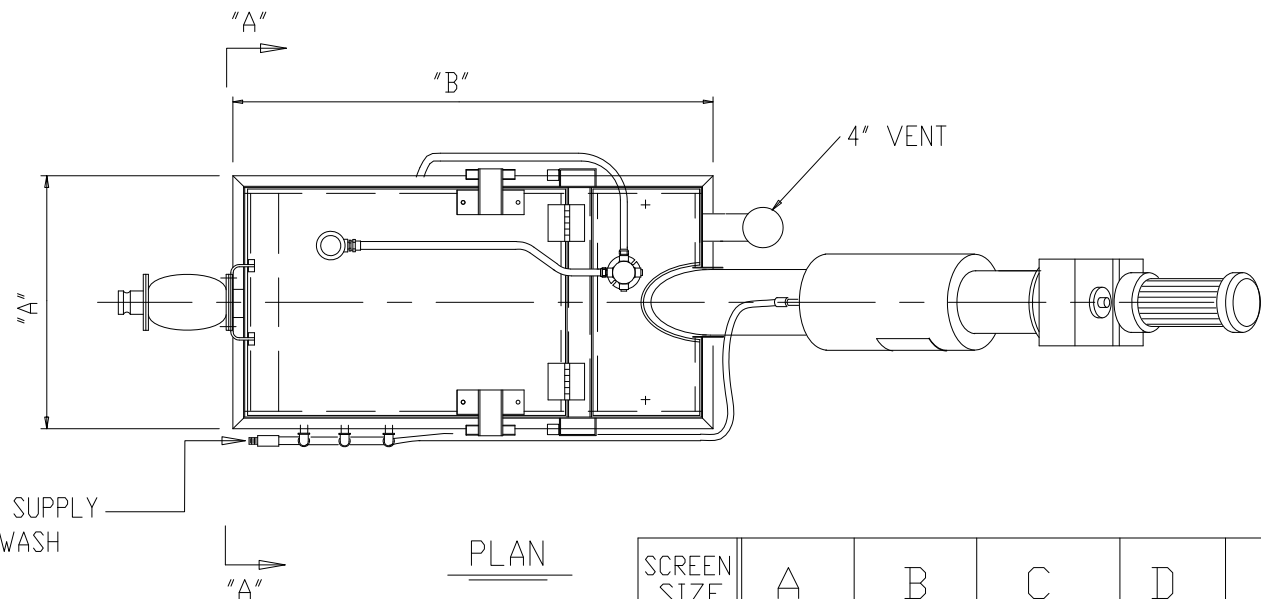
Hauled Waste Receiving Systems

- Septage Acceptance Plant
- Septage Complete Plant

Represented by:
THE MAHER CORPORATION
192 PLEASANT STREET
ROCKLAND, MA 02370
1-800-456-2437

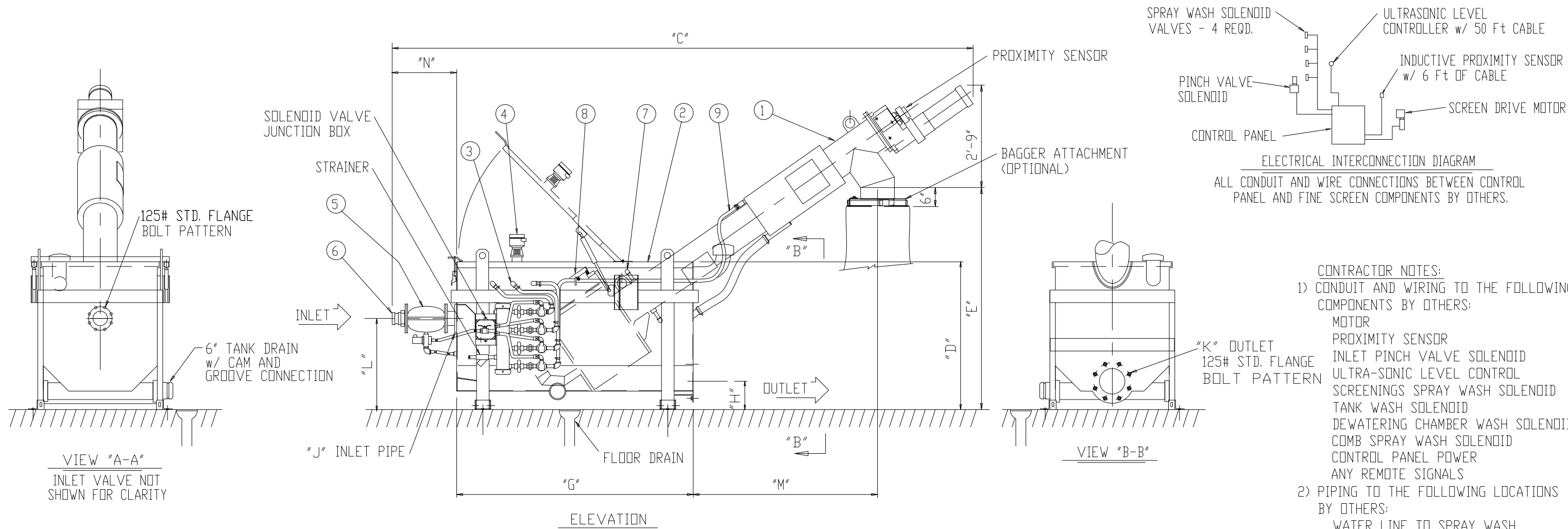


1022 E. Devon, P.O. Box 8448
Bartlett, IL 60103
630.837.5640 FAX: 630.837.5647
E-mail: sales@lakeside-equipment.com



PARTS LIST				
ITEM	QTY	PART No.	DESCRIPTION	MATERIAL
1	1		LAKESIDE FINE SCREEN	STN.STL
2	1		TANK	STN.STL
3	1		TANK SPRAY WASH SYSTEM	STN.STL
4	1		ULTRA-SONIC LEVEL CONTROLLER	
5	1		PINCH VALVE	
6	1		QUICK COUPLER	
7	1		SCREENINGS SPRAY WASH SYSTEM	STN.STL
8	1		LOWER SPRAY WASH SYSTEM	STN.STL
9	1		DEWATERING CHAMBER SPRAY WASH	STN.STL

SCREEN SIZE	A	B	C	D	E	G	H	J	K	L	M	N	DEAD WEIGHT	OPERATING WEIGHT
31	3'-4"	6'-7"	15'-10"	3'-11"	5'-10 1/2"	6'-3"	9"	4"	8"	2'-5"	4'-11"	1'-9"	3200	4000
40	4'-1"	7'-7"	16'-10"	4'-10"	6'-9 1/2"	7'-3"	9"	4"	8"	2'-10"	4'-11"	1'-9"	4100	5600
47	4'-8"	8'-8"	18'-7"	5'-8"	7'-7 1/2"	8'-4"	10"	6"	10"	3'-5"	4'-11"	2'-5 1/2"	5000	6800



Raptor® Complete Plants



For Municipal Wastewater
and Septage Applications



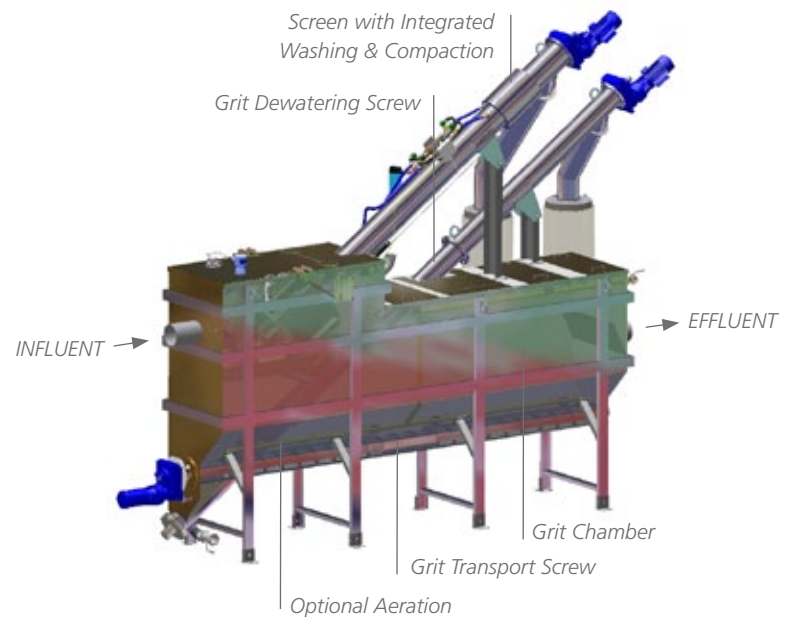
Raptor® Complete Plant

Accepted worldwide as a highly efficient preliminary treatment method, the **Raptor® Complete Plant** is a unique system that combines screening and grit removal into one self-contained unit for treating municipal wastewater.

The fully automated unit is supplied in a pre-engineered stainless steel tank and equipped with a **Raptor®** Fine Screen, Rotating Drum Screen, or Micro Strainer plus grit dewatering and transport screws in the grit removal chamber. The **Raptor®** Complete Plant can be installed either above or below ground.

- Screens, washes, compacts and dewateres more inorganic solids than conventional units
- Removes and dewateres grit

Raptor® Complete Plant Flow Diagram



The unit is constructed of stainless steel for increased corrosion resistance.

Optional grease removal system



The Raptor® Complete Plant combines screening and grit removal into one self-contained, fully automated unit.

Screening

Wastewater flows into the plant's screening basket that retains solids without clogging. Screened material is removed from the screening basket and is spray washed to return organics to the waste flow. The screened material is then transported up the unit's central screw conveyor to storage containers. During transport, the screened material is washed a second time, then compacted and dewatered to a solids content of up to 40 percent.

Grit Collection

The wastewater that flows through the screening basket passes directly into a grit removal chamber. Grit removal is 90 percent of 65 mesh and larger material. Grit settles to the floor of the grit chamber and a grit transport screw moves the settled grit to a sump. The transport screw moves the grit against the wastewater flow creating crosscurrents that help keep organics in suspension. The grit chamber can also be equipped with aeration to maintain organics in suspension.

A grit dewatering screw transports the settled grit out of the sump and dewateres the grit before it is discharged. The grit can be disposed of with the inorganic solids collected by the *Raptor*® screen, or the grit can be disposed of separately.

Aeration

For treatment plants with wide variations in flow, the grit chamber can be equipped with aeration to help control circulation in the unit. The circulation keeps organics in suspension and allows grit to settle to the tank floor regardless of any variation in flow capacity.

Grease Trap

To improve the overall performance of the *Raptor*® Complete Plant and to improve the downstream process operation, the grit chamber can also be equipped with an optional grease trap. Excess grease can be removed manually or a motorized skimmer can be provided.



Optional insulation and heating system available for outdoor/cold climate applications.



The Complete Plant can be designed with a hook-up for disposal of tankered septage.

Features and Benefits

- Pre-engineered by Lakeside to reduce your engineering costs
- Integrated design eliminates expensive concrete forming, as well as added pipes, valves, gates associated with conventional installations
- Small footprint reduces total building volume, saving heating expenditures in cold climates
- Combined screening and grit removal minimizes building size and reduces overall construction costs
- Low headloss saves pumping costs
- All-stainless steel construction assures long equipment life
- Pre-assembled components permit quick and easy installation in a single day
- Easy exterior access for maintenance
- Integrated controls save installation costs
- Enclosed transport and optional bagging attachments reduce odors and ensure a clean work environment
- Heavy duty *Raptor*® Fine Screen, *Raptor*® Rotating Drum Screen, or *Raptor*® Micro Strainer provide superior efficiency, durability and prolonged life for lower operational costs

Options

- Aerated grit chamber
- Insulation and heating system for outdoor and cold climate applications
- Hook-up for disposal of tankered septage
- Available with optional grease trap

Raptor® Septage Complete Plant



Features aerated grit removal.

Available with continuous or individual bagging.

Optional design with two valves to accept loads from two trucks at once.

In addition to municipal and industrial waste, many wastewater treatment plants process septic tank sludges that contain debris and inorganic solids that can negatively impact downstream equipment, decreasing the effectiveness of aeration, dewatering and filtering equipment.

To solve this issue, Lakeside offers its *Raptor®* Septage Complete Plant, a self-contained, fully automatic unit that removes materials that typically pass through a conventional bar screen. Anchored by the reliable *Raptor®* Fine Screen, the *Raptor®* Septage Complete Plant simply and efficiently pretreats the increasing amounts of sludges processed at wastewater treatment plants. Operators welcome the unit's dependability, minimal maintenance and optional advanced administrative features for billing and hauler access. The Septage Complete Plant's accurate metering system and faster processing of loads attracts more haulers, fostering quick payback of the unit.

Quick Processing Cycle

The Septage Complete Plant's large capacity and quick screen cleaning cycle time allows a 3,000 gallon tanker with up to 3 percent solids concentration to be unloaded in less than 10 minutes.

Full Penetration Basket Cleaning

The *Raptor®* Fine Screen offers a rake head that removes grease and debris, eliminating the binding and plugging common with perforated plate screens and step screens.

Raptor® Acceptance Control System (RACS)

Hauler Access, Invoicing and Data Acquisition

With the optional RACS, plant administrators can create and manage customer and truck account information, control sampling, control access on a truck-by-truck basis, track the number and sizes of loads for each hauler and assign PIN numbers from the office. No license fees and non-proprietary data format makes the RACS system a convenient, no-hassle choice.

Raptor® Septage Complete Plant (Cont.)

Raptor® Acceptance Control System (RACS) Cont.

Allen-Bradley Programmable Logic Controller

With built-in Ethernet communications, the RACS hauler station works directly with an inlet valve and flow meter to allow access and record the unloading of each authorized hauler.

Allen-Bradley PanelView Plus Operator Interface

Haulers receive access by a plant-assigned PIN number that activates the system. The hauler then selects one of five waste types on a touch screen. Another option allows magnetic card swipe or a key switch instead of a PIN.

Data Storage and Retrieval

The RACS touch screen makes data accessible via an Ethernet communications interface. A USB data port is also available for use with a removable flash drive. Comma Separated Variable (CSV) files can be viewed with most spreadsheet or database software.

Printer

The hauler receives a printout of the load details, including date, time, hauler name, waste type, total gallons uploaded, elapsed time for unloading and any faults incurred, if applicable.

Management and Accounting System

A pre-configured personal computer periodically scans the RACS hauler station for new transactions and automatically enters them into an accounting system that permits customer tracking, invoicing and report generation. Plant personnel are able to manage the hauler accounts and invoice septage haulers. Software package allows owner to:

- Receive data from up to ten RACS control stations
- Manage septage hauler identification information
- Generate reports and invoices and receive payments
- Record date, gallons and waste type for each load
- Permit entry of a minimum of five waste types and cost-per gallon charges
- Import and export data
- Allow manual entry/import of load transactions

Features and Benefits

- Enclosed operation contains septage and reduces odors and nuisance insects
- Two-stage screenings and washing cleans screenings more thoroughly than ordinary pretreatment systems
- Specialized compaction and 2-hp or 3-hp drive create a dry solids content of at least 40 percent, reducing volume and weight
- Design and all stainless steel construction result in few wearing surfaces for simple operation and long life

Options

- Full weather protection unit
- Continuous or individual bagging attachments
- Raptor® Acceptance Control System (RACS)



RACS Control Panel



Septage Complete Plant with Electrical Control Panel

Treatment equipment and process solutions from Lakeside Equipment Corporation

Lakeside offers a wide range of equipment and systems for virtually all stages of wastewater treatment from influent through final discharge. Each process and equipment item that we supply is manufactured with one goal: to reliably improve the quality of our water resources in the most cost-effective way. We have been doing just that since 1928.

Screw Pumps

- Open Screw Pumps
- Enclosed Screw Pumps

Raptor® Screening Products

- Fine Screen
- Micro Strainer
- Rotating Drum Screen
- Wash Press
- Septage Acceptance Plant
- Septage Complete Plant

Trash and Screen Rakes

- Hydronic Type T Series
- Hydronic Type K Series
- Multi-functional Series
- Horizontal Series
- Catronic Series
- Monorail Series
- HY-TEC Screen

Package Headworks Systems

- Raptor®* Complete Plant
- H-Pac®*

Grit Collection

- SpiraGrit
- Aeroductor
- Inline Grit Collector
- Raptor®* Grit Washer
- Model L Grit Classifier
- Type W Grit Classifier

Biological Treatment Solutions

- Process Monitoring & Control Systems
- Magna Rotors
- Velocity Control Baffles
- Rotor Covers
- Level Control Weirs
- BioJet™ Surface Aerator

Submersible Products

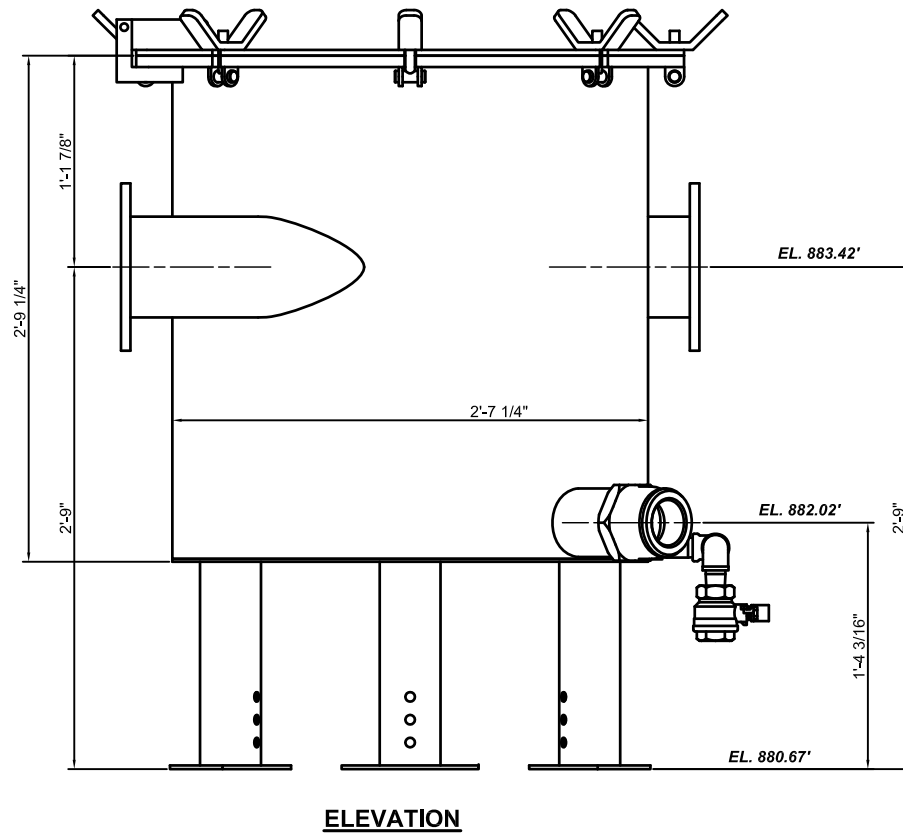
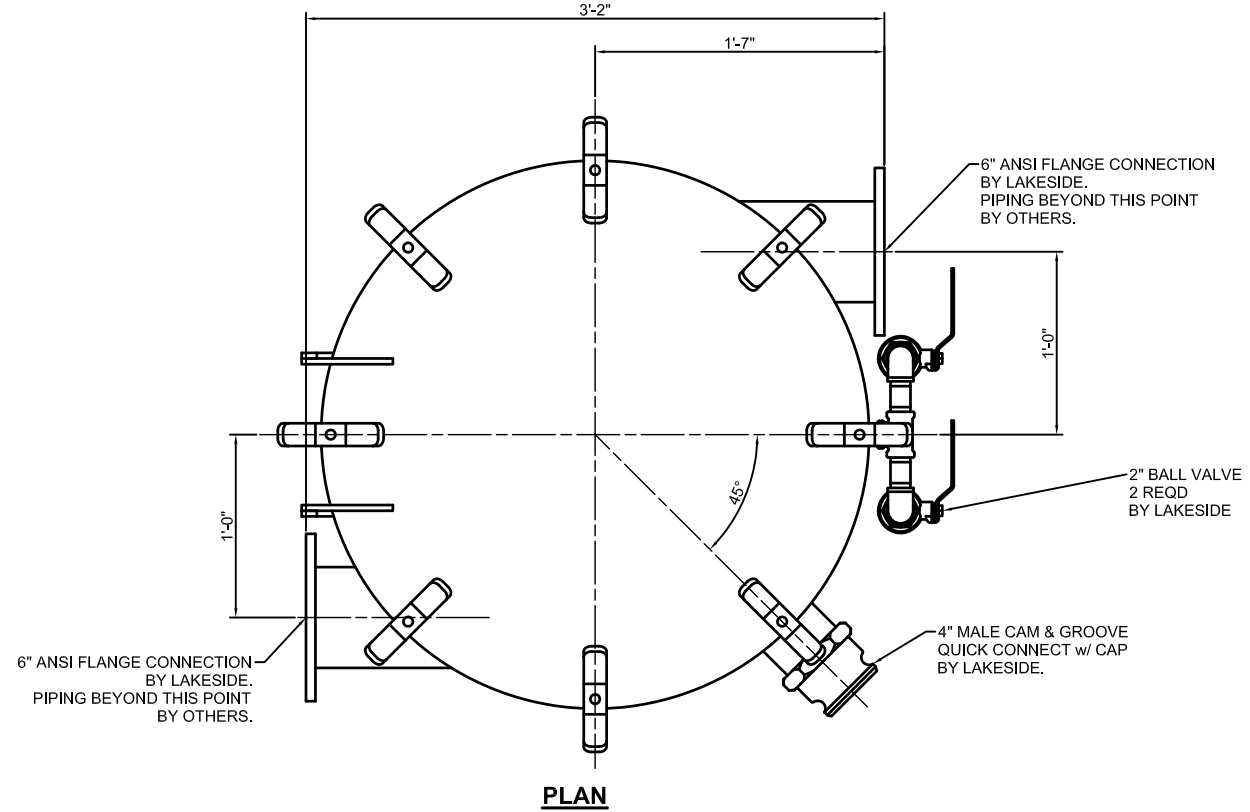
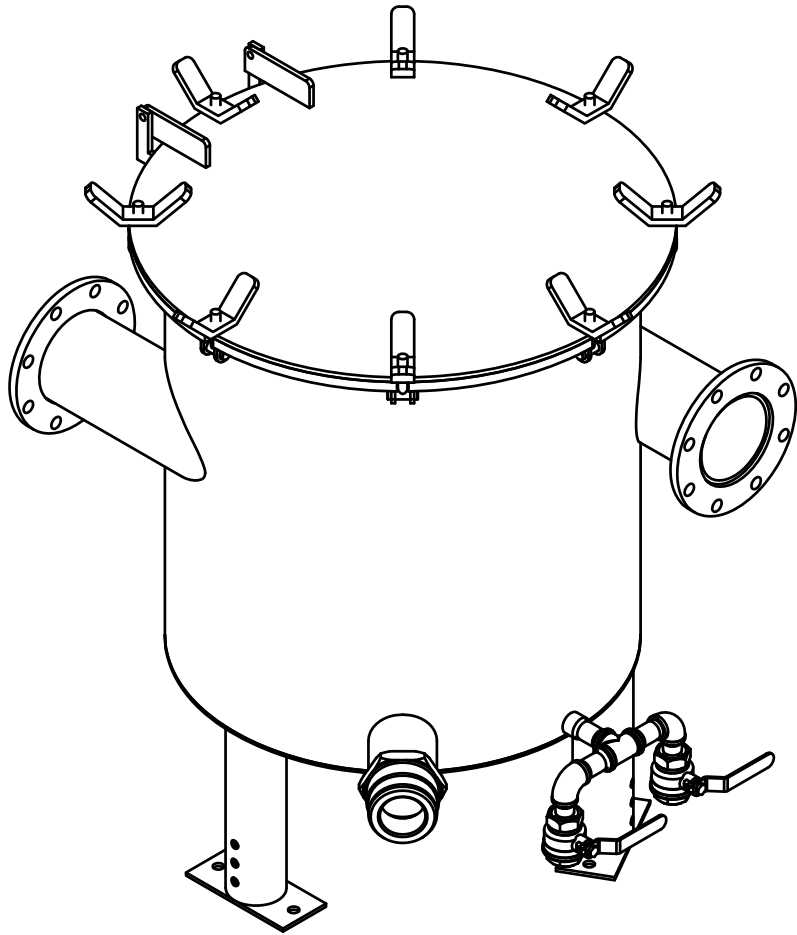
- Low Speed Mixers
- Medium Speed Mixers
- Recirculation Pumps


Filtration and Clarification

- Spiraflo Clarifier
- Spiravac Clarifier
- Full Surface Skimming
- MicroStar™ Filter



1022 E. Devon, P.O. Box 8448
Bartlett, IL 60103
630.837.5640 FAX: 630.837.5647
E-mail: sales@lakeside-equipment.com



 Water Purification Since 1928		PROJECT	
		TITLE ROCK TRAP - TYPE "H" w/ HINGED COVER	
DRAWN GF	DATE 5/15/2013	SIZE D	S.O. #
CHECKED JS	DATE 5/17/2013	DWG NO D92832S	REV
COPYRIGHT © 2013 LAKESIDE EQUIPMENT CORPORATION		SCALE	FILE NO. 250

RAPTOR[®] SEPTAGE COMPLETE PLANT

DATE: 16-Feb-16

PROJECT: Portsmouth, New Hampshire - Pease

ENGINEER: Stantec

SALES REPRESENTATIVE: The Maher Corporation

Number of RAPTOR [®] Septage Complete Plants	- 1
RAPTOR [®] Septage Complete Plant Model Number	- 31SCP-A
RAPTOR [®] Screen Model, inches	- 31
Bar Spacing, inches	- 0.25
Screen Maximum Rated Capacity at 3% solids, gal/min	- 400
Tank Length, feet	- 15.67
Tank Width, feet	- 3.50
Tank Height, feet	- 9.08
Wash Water Flow Rate, gal/min	- 5 to 15
Wash Water Pressure, psig	- 60

RAPTOR[®] SEPTAGE COMPLETE PLANT BUDGET PRICING

Budget pricing for the RAPTOR[®] Lakeside Septage Complete Plant is as follows:

Model:	- 31SCP-A
Unit Price:	- \$275,900 per unit
Total Price:	- \$275,900 for project
Estimated Shipping Weight per Unit:	- 7,000 lb
Estimated Maximum Live Weight per Unit:	- 41,600 lb
Estimated Installation Time per Unit:	- 80 hours

**** Due to the current volatility of stainless steel prices, please contact Lakeside for a final budget cost estimate prior to advertisement for bids for this project.**

RAPTOR[®] SEPTAGE COMPLETE PLANT STANDARD FEATURES

Each Lakeside *RAPTOR[®]* Septage Complete Plant is furnished with the following:

- Lakeside *RAPTOR[®]* Septage Complete Plant Model **31SCP-A** complete with:
 - Lakeside *RAPTOR[®]* Fine Screen Model **31** FS - **0.25** - **89**
 - Drive assembly complete with a cycloidal-helical speed reducer and a **2** hp NEMA C-face premium-efficiency motor suitable for a Class I - Division 1 - Group D explosion-proof environment
 - Lower wash system
 - Screenings wash system
 - Compaction zone flush system
 - Solenoid valves (3) for flow control that are factory pre-wired to a NEMA 4/7/9 junction box
 - Stainless steel ball valves (3)
 - Plant water strainer
- Milltronics MultiRanger 100 ultrasonic level sensor with ST-H transducer and handheld programmer
- Grit blower package complete with:
 - Positive displacement blower
 - Premium-efficiency motor
 - V-belt and sheave drive
 - Fabricated carbon steel base with factory finish paint
 - Combination inlet air filter and silencer
 - Check valve
 - Blow-off valve
 - Outlet silencer
 - FRP sound enclosure
- All stainless steel tank complete with:
 - 3/16-inch thick stainless steel end plates
 - 10 gauge (0.135-inch) thick stainless steel sides and bottom
 - Adjustable feet (+ 3/4-inch) for leveling the tank
 - Lift off and gasketed screen and grit system access covers
 - Air or water operated pinch valve for inlet flow control
 - Schedule 40S 12-inch long plain end inlet and outlet pipe stubs for connecting piping
 - Tank drain line with 3-inch ball valve
 - Horizontal grit screw of all stainless steel construction with 1 hp NEMA C-face premium-efficiency motor for a Class I - Division 1 - Group D explosion-proof environment and cycloidal-helical speed reducer
 - Grit dewatering screw of all stainless steel construction with 2 hp NEMA C-face premium-efficiency motor for a Class I - Division 1 - Group D explosion-proof environment and cycloidal-helical speed reducer
 - Grit screws have 1/2-inch wide Lincore 60-G, or equal, hardened weld for superior abrasion resistance
 - Grit washing system complete with piping and needle valve
 - Lift out aeration headers with self-sealing membrane diffusers
- Local-mounted main control panel (MCP) complete with:
 - Fusible disconnect switch with door handle
 - 480/120 VAC 500 VA control transformer with one (1) set of spare fuses

- Variable frequency drive (VFD) with line reactor for each of the following:
 - ◆ Fine Screen 2 hp drive motor
 - ◆ Blower 2 hp drive motor
- Starter for the Horizontal Grit Screw 1 hp motor
- Starter for the Grit Dewatering Screw 2 hp motor
- Allen-Bradley MicroLogix 1100 programmable logic controller (PLC) with LCD screen and 10/100 Base T Ethernet complete with control logic for functional operation
- Cabinet heater for outdoor applications if required
- Proximity sensor switching amplifier for the Fine Screen
- Door-mounted elapsed time meters for the following:
 - ◆ Fine Screen
 - ◆ Horizontal Grit Screw
 - ◆ Grit Dewatering Screw
 - ◆ Blower
 - ◆ OPTIONAL grease collector skimmer
 - ◆ OPTIONAL grease pump
- Transient voltage surge suppressor (TVSS)
- HAND-OFF-AUTO switches for each of the following:
 - ◆ Fine Screen
 - ◆ Lower spray wash system
 - ◆ Screenings spray wash system
 - ◆ Compaction zone flush system
 - ◆ Tank wash system
 - ◆ Horizontal Grit Screw
 - ◆ Grit Dewatering Screw
 - ◆ OPTIONAL grease collector skimmer
 - ◆ OPTIONAL grease pump
- FORWARD-OFF-REVERSE momentary contact switches for each of the following:
 - ◆ Fine Screen
 - ◆ Horizontal Grit Screw
 - ◆ Grit Dewatering Screw
- Blower HAND-OFF switch
- E-STOP pushbutton [red]
- CYCLE/RE-SET pushbutton [black]
- Full-voltage LED pilot lights for each of the following:
 - ◆ Power ON [white lens]
 - ◆ Screen RUN [green lens]
 - ◆ Horizontal Grit Screw RUN [green lens]
 - ◆ Grit Dewatering Screw RUN [green lens]
 - ◆ Blower RUN [green lens]
 - ◆ OPTIONAL Grease Skimmer RUN [green lens]
 - ◆ OPTIONAL Grease Pump RUN [green lens]
 - ◆ Common FAULT/MALFUNCTION [red lens]
 - ◆ Screen high water level ALARM [amber lens]

- Isolated contacts for each of the following:
 - ◆ Screen RUN
 - ◆ Horizontal grit screw RUN
 - ◆ Grit dewatering screw RUN
 - ◆ Blower RUN
 - ◆ Common screen malfunction/fault ALARM
 - ◆ High water level ALARM
- White phenolic nameplates with black lettering
- 600 VAC terminal block
- U.L. label for the project application
- NEMA 4/12 painted steel wall-mounted enclosure
- Number of service trips to the project site
- Number of 8-hour days of start-up service on the project site
- Freight allowed FOB our factory in Chariton, Iowa to the project site

-	2
-	3

***RAPTOR*[®] SEPTAGE COMPLETE PLANT OPTIONAL FEATURES**

Lakeside offers a number of options as part of its *RAPTOR*[®] Septage Complete Plant Package. These options include the following:

- **All AISI Type 316 stainless steel construction** for the *RAPTOR*[®] Septage Complete Plant:

Add-Deduct Price/Unit - **\$21,420** for Model **31SCP-A** per unit

- **Extra height** of the *RAPTOR*[®] Fine Screen and Grit Dewatering Screw:

Add-Deduct Price/Unit - **\$1,000** per foot of vertical height per unit

- **Explosion-proof design** complete with a local control station to meet a Class I - Division 1 - Group D explosion-proof environment with the noted items removed from the main control panel to the operator local control station (LCS):

- HAND-OFF-AUTO selector switches for each of the following:
 - ◆ Fine Screen
 - ◆ Common screen wash systems solenoid valves
 - ◆ Tank wash system
 - ◆ Horizontal Grit Screw
 - ◆ Grit Dewatering Screw
 - ◆ OPTIONAL grease collector skimmer
 - ◆ OPTIONAL grease pump
- FORWARD-OFF-REVERSE momentary contact switch for the Fine Screen:
- Blower HAND-OFF switch

- E-STOP pushbutton [red]
- CYCLE/RE-SET pushbutton [black]
- White phenolic nameplates with black lettering
- NEMA 4/7/9 cast aluminum enclosure

Add Price/Unit - **\$5,670**

- **Second inlet** to include inlet quick-connect coupling, coupling cover and inlet pinch valve:

Add Price/Unit - **NA for 31SCP** for a **4**-inch diameter inlet
 Add Price/Unit - **NA for 31SCP** for a **6**-inch diameter inlet

- **Weather protection system** of entire screenings transport tube and grit dewatering screw length for cold weather indoor or outdoor applications complete with heat tracing, thermostat and an FRP protective jacket with encapsulated insulation:

Add Price/Unit - **\$27,700** plus/minus **\$1,400** \$/ft for non-explosion proof design
 Add Price/Unit - **\$28,490** plus/minus **\$1,600** \$/ft for explosion proof design

NOTE: This option will add 4 weeks to the delivery schedule.

- **Bagging attachment** with replaceable plastic bags for compacted and dewatered screenings and washed and dewatered grit:

Add Price/Unit - **\$1,260** for individual bag design - does not include bags
 Add Price/Unit - **\$210** for one (1) case of fifty (50) bags for the individual bag design
 Add Price/Unit - **\$1,760** for continuous hose bag design with replaceable cartridge with 262-ft of hose and two (2) replacement cartridges
 Add Price/Unit - **\$120** for replacement cartridge with 262-ft of hose

- **External rock trap** for those facilities that anticipate a large volume of rocks and stone from cesspools. See drawings D-93196-S and D-92873-S respectively for the two types of rock traps:

Add Price/Unit - **\$12,200** for Type "K" for Model 31SAP and Model 40SAP
 - **\$12,560** for Type "K" for Model 47SAP
 Add Price/Unit - **\$16,070** for Type "H" for Model 31SAP and Model 40SAP
 - **\$16,430** for Type "H" for Model 47SAP

- **Grease collection system** can be added to capture grease that is normally present wastewater. This system increases the tank width by 2 ft. Grease is manually skimmed by a downward-opening weir gate to a grease collection sump. A 1 hp positive displacement grease pump that recycles grease back through the screen or to an external grease handling system:

Add Price/Unit - **\$42,900**

- **Automated grease skimmer system** - can be added to mechanically skim grease from the tank surface to the grease collection sump. The skimmer includes a 3/4 hp drive, non-metallic chain and flight skimmer and stainless steel shafts and bearings:

Add Price/Unit - **\$11,800**

- **NEMA 4X enclosure** for the main control panel:

Add Price/Unit - **\$290** for a NEMA 4X stainless steel enclosure

Add Price/Unit - **\$190** for a NEMA 4X FRP enclosure

Add Price/Unit - **\$2,930** for a NEMA 4X stainless steel enclosure with white fused epoxy coating for outdoor location to minimize heat build-up complete with lockable front door with window. All HOA switches, FOR switch, indicating lights, and running time meter are mounted on a dead front swing out panel for security purposes. E-STOP and CYCLE/RE-SET pushbuttons are mounted on the side of the panel enclosure.

- **Local septage hauler control station** complete with REGULAR-HEAVY load selector switch and system common MALFUNCTION/FAULT LED pilot light in a NEMA 4X enclosure to be located near the hauler connection point. This station will be used when the Septage Complete Plant is located indoors and the hauler connection point is located outdoors, or when the Security Access System - Automated Data Acquisition System option is not selected:

Add Price/Unit - **\$480**

- **Magnetic flow meter** by Yokogawa that can be part of the *RAPTOR*® Access Control Station (R.A.C.S.) and the Data Management and Accounting System below for recording and totalizing each hauler load:

Add Price/Unit - **\$6,130** for a 4-inch flow meter

Add Price/Unit - **\$8,350** for a 6-inch flow meter

- **Allen-Bradley programmable logic controller (PLC) Optional Models** with LCD display, 10/100 Base T Ethernet port, relays and timers to monitor equipment-mounted electrical devices and to perform necessary logic functions with back-up memory module in lieu of MicroLogix 1100 PLC:

Add Price/Unit	-	\$2,720	for MicroLogix 1400 PLC
Add Price/Unit	-	\$7,740	for CompactLogix L16ER PLC & PanelView Plus 3.8" keypad

- **RAPTOR[®] Access Control Station (RACS)** complete with the following items:

- 120 VAC - 60 Hertz - 1 Phase power supply
- NEMA 4X hinged polyester weather proof instrument cover
- Allen-Bradley MicroLogix 1100 programmable logic controller (PLC)
- Communications port - includes memory module
- Allen-Bradley PanelView Plus 700 HMI complete with Ethernet communications port, Web Studio Runtime, USB ports, compact flash card port, and protective overlay for touchscreen - 5 digit PIN access
- 2.25-inch thermal impact receipt printer for identifying hauler name, hauler identification, date, time totalized flow or tanker volume with auto cutter, front loading paper, and two (2) paper rolls
- Panel heater, thermostatically controlled
- Transient voltage surge suppressor (TVSS)
- MCR safety circuit
- Ethernet switch, 5 port, Cat 5
- External USB interface for data transfer
- 4 GB USB flash disk for data transfer
- 2 GB compact flash disk for HMI data storage
- System FAULT full-voltage LED pilot light
- One (1) spare fuse set
- NEMA components with 30 mm operators
- NEMA 4X lockable enclosure for local operator control station for swipe card, HMI, receipt printer, with 20-in. high by 24-in. wide by 12-in. deep enclosure

Add Price/Unit	-	\$15,040	for each base RACS system
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The following options and spare parts are available for the *RAPTOR[®]* Access Control Station (RACS):

Add Price/Unit	-	\$1,120	for enclosure white fused epoxy coating to minimize heat
Add Price/Unit	-	\$220	for NEMA 4X hinged window, locking enclosure, w/ 2 keys
Add Price/Unit	-	\$1,520	for key switch with 100 keys for secondary security access
Add Price/Unit	-	\$1,520	for magnetic swipe card reader
Add Price/Unit	-	\$210	for a pack of 100 magnetic swipe cards for card reader
Add Price/Unit	-	\$3,870	for credit card reader - requires Ethernet connection
Add Price/Unit	-	\$1,310	for inlet valve position command, 4-20 mA signal I/O
Add Price/Unit	-	\$400	for external discreet sampler system control enabled

Add Price/Unit	-	\$800	for customizable unload data configuration for plant SCADA
Add Price/Unit	-	\$730	for I/O signals in lieu of using Ethernet
Add Price/Unit	-	\$1,460	for 30-in. leg kit for mounting RACS panel
Add Price/Unit	-	\$510	for red flashing alarm light
Add Price/Unit	-	\$1,680	for 600 VAC, 30 Amp SUSU non-fusible disconnect
Add Price/Unit	-	\$3,450	for Allen-Bradley 1609-U uninterruptible power supply (UPS)
Add Price/Unit	-	\$230	for one (1) spare fuse set
Add Price/Unit	-	\$20	for one (1) spare receipt paper roll

■ **Data Management and Accounting System** complete with the following items:

- System will include an automated accounting system software package that enables plant personnel to administer the septage and scavenged sludge haulers. The accounting system will use an off-the-shelf accounting software package from a major software manufacturer. This software package will be installed on a Windows based computer, which will act as the central computer for the accounting system.
- Intuit QuickBooks automated accounting software that will allow the Owner to:
 - ◆ Receive data from Acceptance Control Stations supplied as part of the septage receiving equipment
 - ◆ Manage septage hauler companies and truck identification information
 - ◆ Generate invoices and receive payments
 - ◆ Generate reports
 - ◆ Record the date, time, gallons, and waste type for each load
 - ◆ Permit entry of a minimum of five (5) waste types with individual cost per gallon charge
 - ◆ Import and export data to and from Microsoft Office documents
 - ◆ Allow manual entry/import of load transactions
- The accounting system will be capable of connecting to a minimum of ten (10) access control stations
- All communications between the Access Control Stations (R.A.C.S.) and the Data Management and Accounting System computer will be over a 10/100 BASE-T Ethernet connection
- Personal computer (PC) will meet the following minimum hardware and software requirements:
 - ◆ Intel® Processor I
 - ◆ 100 GB hard drive
 - ◆ 1024 MB RAM
 - ◆ Microsoft Windows 7 operating system software
 - ◆ Keyboard
 - ◆ Wireless optical mouse
 - ◆ 19-inch flat panel LCD display
 - ◆ 10/100 Ethernet card
- PC hardware and software will be configured as part of the septage receiving system. The automated accounting system software package will be furnished and tested as a complete system with the controls furnished by the septage equipment manufacturer/control panel manufacturer

Add Price/Unit	-	\$10,930	for data management and accounting system with PC
Add Price/Unit	-	\$8,540	for system with customer-supplied PC per requirements above

■ **Main control panel optional items** can be provided for the following budget price of:

Add Price/Unit	-	\$1,310	per unit for NEMA electrical standards design
Add Price/Unit	-	\$740	per unit for a 208 or 240 power supply in lieu of 480 VAC
Add Price/Unit	-	\$1,460	per unit for a 30-in. high main enclosure leg kit
Add Price/Unit	-	\$500	per unit for push-to-test full-voltage LED pilot lights
Add Price/Unit	-	\$170	per unit for a main enclosure interior panel light
Add Price/Unit	-	\$380	per unit for a convenience outlet
Add Price/Unit	-	\$690	per unit for a alarm horn or alarm light
Add Price/Unit	-	\$740	per unit for a combination alarm horn and beacon
Add Price/Unit	-	\$380	per unit for a 5" x 7" window kit to view VFD display
Add Price/Unit	-	\$3,450	per unit for an uninterruptible power supply (UPS)
Add Price/Unit	-	\$1,250	per unit for 3 Phase surge suppression in lieu of 1 Phase
Add Price/Unit	-	\$580	per unit for lightning arrestor, 3 Phase

■ **Spare parts** can be provided at the following costs:

● One (1) set of water-jet cut rake heads and mounting hardware	-	\$2,630
● One (1) brass slow close solenoid valve	-	\$320
● One (1) solenoid valve re-build kit	-	\$170
● One (1) screw tail sleeve bearing, stainless steel wear sleeve, and seals	-	\$550
● One (1) spare fuse set of each size and type	-	\$230
● One (1) spare set of blower inlet filter cartridges	-	\$240

■ **Extra service** can be provided at a rate noted below plus travel costs and per diem costs:

Add Price	-	\$750	for each additional trip to the project site
Add Price	-	\$1,080	for each additional 8-hour day on the project site

***RAPTOR*[®] SEPTAGE COMPLETE PLANT DRAWINGS AND FABRICATION TIMES**

The *RAPTOR*[®] Septage Complete Plant will require the following times to complete our contractual obligations:

■ Shop Drawing Time after receipt of fully-executed purchase order:	-	6 to 8	weeks
■ Fabrication Time after shop drawing approval and release to our shop:	-	24 to 28	weeks

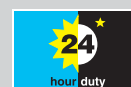
520SN/REL, 520UN/REL, 520DuN/REL IP66 pumps fitted with LoadSure® element pumpheads

500series

Watson-Marlow Bredel

FEATURES

- Flow rates up to 3500ml/min at 2 bar (30psi) peak pressure with 520 LoadSure® elements
- 520REL pumphead features large swept volume with sprung rollers for high accuracy, gentle pumping of shear-sensitive fluids
- Robust pumphead construction with PPS (polyphenylene sulphide) track and rotor and stainless steel rollers and bearings
- Precise 2200:1 speed control range from 0.1 to 220rpm in 0.1rpm increments
- Maintenance free brushless DC motor
- IP66 enclosure provides the highest level of ingress protection for arduous conditions and high pressure washdown environments
- Manual control with additional flow calibration and MemoDose for accurate single shot dispensing
- Dual voltage, 115V/230V 50/60Hz



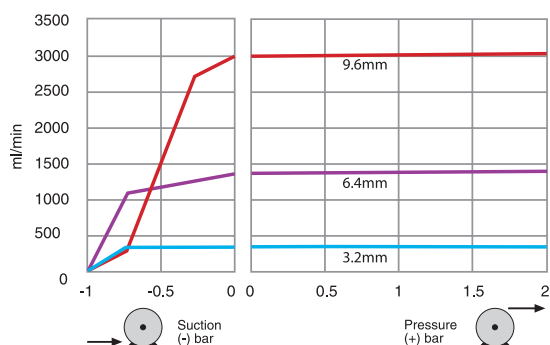
FUNCTIONALITY

Pump drives	520SN	520UN	520DuN
Manual control			
Full calibration with choice of flow units			•
Simple calibration to display flow in ml/min	•	•	
Choice of flowrate or speed display	•	•	•
Remote control			
Run/Stop, direction change, Auto/manual toggle, leak detector input (via contact closure or 5V TTL or 24V industrial logic)		•	•
Remote operation of MemoDose (foot/hand-switch or logic input)		•	•
Analogue speed control			
Software programmable inputs; 0-10V, 1-5V or 4-20mA		•	•
Analogue outputs; 0-10V (8 bit resolution)		•	
Analogue outputs; 0-10V, 4-20mA (high resolution)			•
Keypad/analogue input scaling (replacement of diaphragm pumps)			•
Tacho frequency output; 0-1258Hz	•	•	
Digital communication			
RS485 network control			•
Security			
Basic security code to protect set-up		•	•

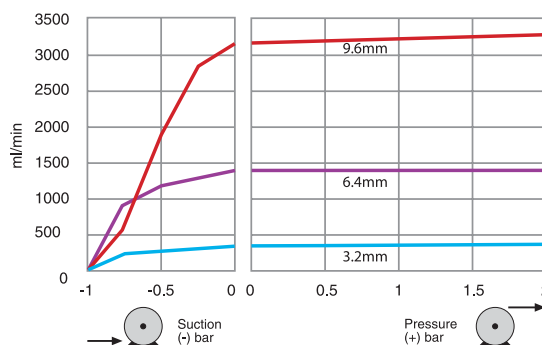
PERFORMANCE

LoadSure® Element tubing flow rates (ml/min)				
Tube Material	Speed	3.2mm	6.4mm	9.6mm
Pumpsil, Sta-Pure, Chem-Sure, Neoprene	0.1 to 220rpm	0.18-390	0.70-1500	1.6-3500
MarpreneTL, Bioprene TL	0.1 to 220rpm	0.17-370	0.67-1500	1.5-3300

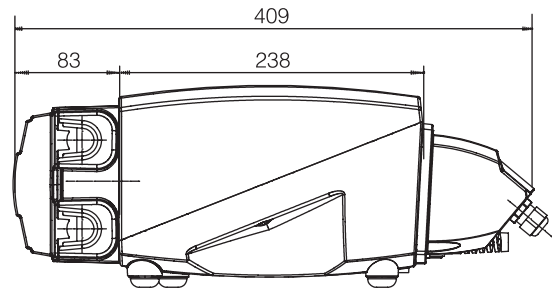
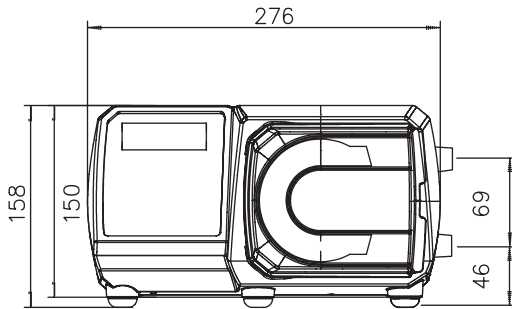
Marprene TL 0-2 bar CCW 200rpm



Sta-Pure 0-2 bar CCW 200rpm



DRAWINGS



All dimensions in mm

SPECIFICATIONS

	520SN, 520UN, 520DuN
Ingress rating	IP66 / NEMA 4X
Enclosure	Watertight / dustproof
Suitability	Corrosion resistant for heavy industrial environments
Humidity	(Condensing) 10-100% RH
Temperature	5C to 40C (40F to 104F)
Pump weight	10.7kg, 23lb 9oz
Control ratio	2200:1
Torque rating	2.2Nm, continuous duty
Noise	< 70dB(A) at 1m
Standard	CE, cETLus
Power supply	115/230V 1ph 50/60Hz

MATERIALS OF CONSTRUCTION

Component	Material
Keypad	Polyester
Switch-plate	Glass filled ABS plastic
Rear blanking plate	Stainless steel 304
Drive casework	Pressure die-cast aluminium LM24
Case work coating	Alocrom pre-treatment, exterior grade polyester powder coat
Drive shaft	Electroless nickel plated carbon steel
Pumphead track	PPS (polyphenylene sulphide)
Guard - inner/outer	Polycarbonate
Guard seal	Neoprene
Rotor hub	Stainless steel 316
Roller arms, rotor cover	PPS (polyphenylene sulphide)
Rollers – main/guide	Stainless steel 316
Main roller bearings	Stainless steel with PTFE seals
Drain port and nut	PP (polypropylene)
Drain plug	Hytre

ORDER INFORMATION

Pump and pumphead product codes

Description	Partcode	Description	Partcode
520REL element pumphead only	053.1011.EL0	520SN drive only	056.713N.000*
520SN/REL pump	050.713N.EL0*	520UN drive only	056.714N.000*
520UN/REL pump	050.714N.EL0*	520DuN drive only	056.715N.000*
520DuN/REL pump	050.715N.EL0*	Leak Detector	059.8131.000

* Replace 0 (plug-less) with A for 2.8m American mains lead

Element product codes

	Industrial LoadSure® elements			Industrial LoadSure® elements		
	Quick-release PVDF connectors			³ / ₄ in Sanitary PVDF connectors		
	3.2mm	6.4mm	9.6mm	3.2mm	6.4mm	9.6mm
Marprene TL	902.0032.PFQ	902.0064.PFQ	902.0096.PFQ			
Pumpsil	913.A032.PFQ	913.A064.PFQ	913.A096.PFQ	913.A032.PFT	913.A064.PFT	913.A096.PFT
Neoprene	920.0032.PFQ	920.0064.PFQ	920.0096.PFQ			
Chem-Sure	965.0032.PFQ	965.0064.PFQ	965.0096.PFQ	965.0032.PFT	965.0064.PFT	965.0096.PFT
Bioprene TL				903.0032.PFT	903.0064.PFT	903.0096.PFT
Sta-Pure				960.0032.PFT	960.0064.PFT	960.0096.PFT

All flow rates shown were obtained pumping water at 20C (68F) with zero suction and delivery heads. Watson-Marlow, Bioprene and Marprene are trademarks of Watson-Marlow Limited. Disclaimer: The information contained in this document is believed to be correct but Watson-Marlow Limited accepts no liability for any errors it contains, and reserves the right to alter specifications without notice. LoadSure is a trademark of Watson-Marlow Limited. @ Chem-Sure and @ STA-PURE are registered trademarks of W.L. Gore & Associates Inc. Please state the product code when ordering pumps and tubing.



Watson-Marlow-Bredel Pumps
Falmouth, Cornwall England TR11 4RU
Tel: +44 (0)1326 370370 Fax: +44 (0)1326 376009
www.watson-marlow.com info@watson-marlow.co.uk

EleMech, Inc.



PortALogic



Waste Dump Station Model DS-82

PortALogic Management Software Included

For Controlling Access, Metering, and Sampling

Receiving waste from haulers such as septage is an essential process, but needs critical attention. Managing hauled-in waste irresponsibly could have adverse effects. Without an efficient process in place, it can also be costly. You see firsthand the challenges your facility faces and understand the importance of security, record keeping, and minimizing costs. Ensuring your receiving process is successful matters to you and to us.

We are EleMech, we created PortALogic stations to help you manage trucked-in waste. Our sole mission with PortALogic is to help facilities manage waste responsibly while decreasing costs through our automated stations paired with our PortALogic management software. Since 1987, facilities have been looking to us to provide stations that meet their unique needs. Get started with us and let us help you meet your goals.


Buy Now - Call EleMech, Inc. at 630-499-7080 to order a station for your site

PortALogic Waste Dump Station - Model DS-82

DS-82

The DS-82 waste dump station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card. The station encloses an electrically actuated valve, flow meter, pH sensor, and sampler. It seamlessly communicates with PortALogic management software.

SPECIFICATIONS

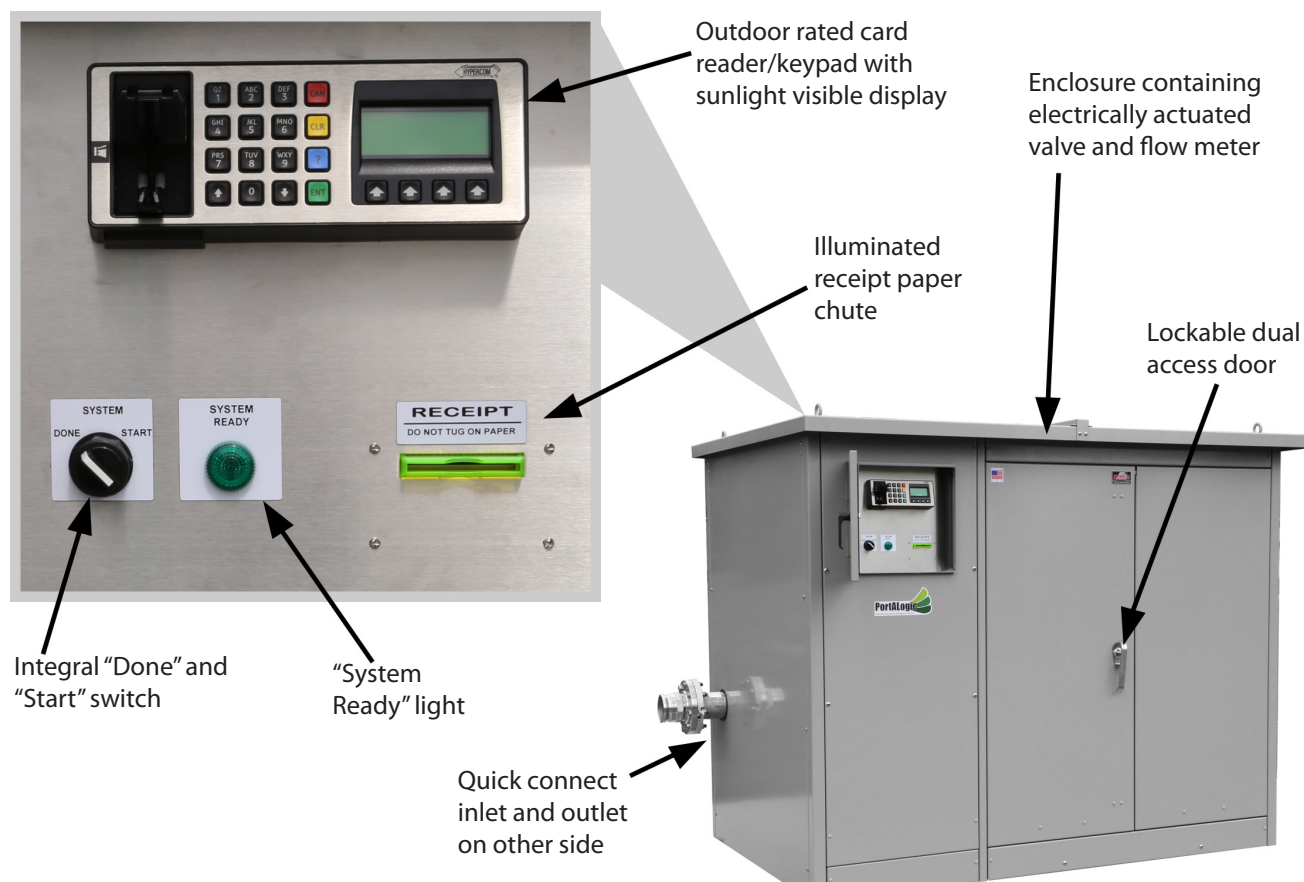
Enclosure	Dual access door- locking handle, water tight, outdoor rated type 3R, corrosion resistant, coated galvanized steel
Hauler Access	Industrial display with card reader and keypad
Receipt Printer	Heavy duty kiosk-style printer, illuminated chute, large capacity roll
Interior	Encloses quick opening electrically actuated valve (4" or 6"), flow meter, pH sensor, refrigerated sampler, and power panel.
Power	240/120VAC, *30 AMP
Rate of Flow	Up to 1,100 gallons per min (4,164 liters per min)
Temperature	Operating temperature range -40°F to 122°F (-40°C to 50°C)
Software	Station interfaces with PortALogic management software for record keeping, billing, monitoring, and reporting
Certifications	

TYPES OF WASTE

Septage
Fats-Oils-Grease (FOG)
Sludge
Frac Water
Other Waste



Ideal for discharging curbside and at unattended sites



PortALogic Waste Dump Station - Model DS-82

OPTIONS

Solar Powered	Stations can be powered by solar energy for remote installations
Cold Climate Package	Heaters, insulation, and heat tracing can be added to protect the station in cold climates
Hot Climate Package	Air conditioners and sunshields can be added to protect the station in hot climates
Gate/Door Control	The station can interface with automatic gates and doors if needed

HAULER ACCESS STATION OPERATION

1.	Hauler connects truck to inlet connection
2.	Hauler turns the switch to "Start"
3.	Hauler uses wipe card or enters PIN
4.	Hauler follows display prompts and enters information such as waste type
5.	Inlet valve opens, "System Ready" light illuminates, and hauler discharges
6.	Hauler turns the switch to "Done" and a receipt is printed detailing the transaction

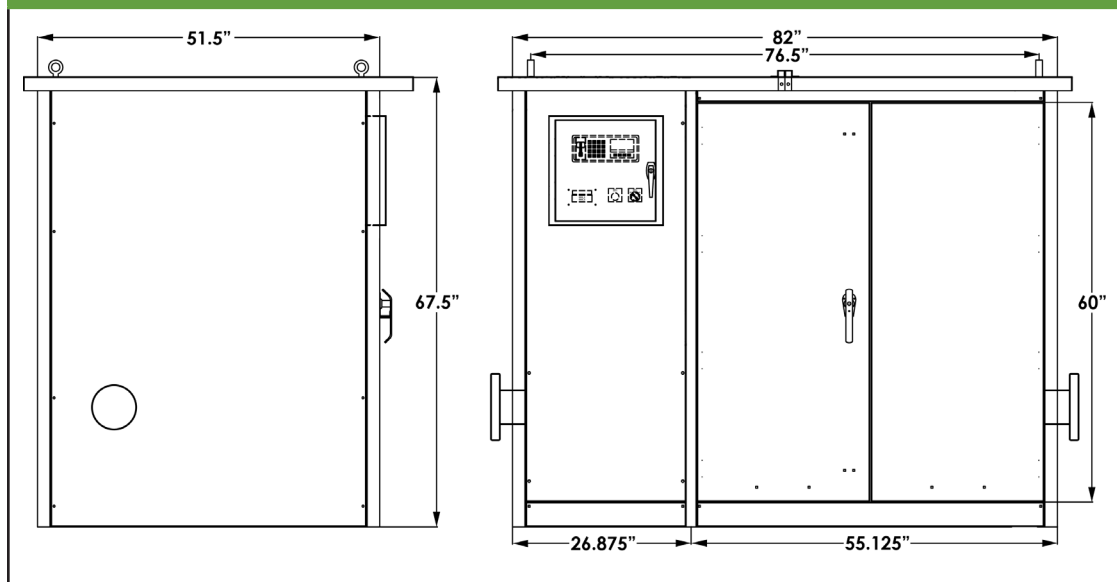
INSTALLATION

Stations come fully assembled, tested, and ready to install. The station comes with PortALogic management software which can be installed on any number of the facility's PCs.

WARRANTY

All components furnished in specification are guaranteed for two years from date of shipment. Management software updates and phone support is provided for two years from date of shipment.

DIMENSIONS



INSTALLATIONS

More than

100

Throughout the U.S.
and Canada

PortALogic Waste Products:



DS-200

The DS-200 waste dump station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card.



DS-22

The DS-22 waste dump station is secure and controls the valve. This station includes a pedestal base enclosing an electrically actuated valve.



DS-25

The DS-25 waste dump station is secure, controls the valve, and provides metering. This station encloses an electrically actuated valve and flow meter.



DS-82

The DS-82 waste dump station is the complete solution for waste receiving. This station encloses an electrically actuated valve, flow meter, sampler, and pH sensor.



For more information about PortALogic, please contact an EleMech engineer at 630-499-7080 or visit www.portalogic.info.

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2275 White Oak Circle
Aurora, IL 60502
Office: 630-499-7080
www.portalogic.info
www.elemech.com

PortALogic

A Product of EleMech, Inc.



DS-25 Waste Dump Station

PortALogic Management Software Included

For Controlling Access and Metering

Receiving waste such as septage, fats-oils, grease, and sludge is an essential process in need of critical attention. Managing hauled-in waste irresponsibly could have adverse effects. Without an efficient process in place, it can also be costly. You see firsthand the challenges your facility faces and understand the importance of security, record keeping, and minimizing costs. Ensuring your waste receiving process is successful matters to you and to us.

We are EleMech, we created PortALogic stations to help you manage trucked in waste. Our sole mission with PortALogic is to help facilities manage waste responsibly while decreasing costs through our automated waste receiving stations. Since 2000, facilities have been looking to us to provide stations to meet their unique needs. Get started with us and let us help you meet your goals.


Buy Now - Call EleMech, Inc. at 630-499-7080 to order a station for your site

PortALogic Waste Dump Station - Model DS-25

DS-25

The DS-25 waste dump station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card and includes a pedestal base with an electrically actuated valve and flow meter. It seamlessly communicates with PortALogic management software.

SPECIFICATIONS

Enclosure	Access door- locking handle, water tight, outdoor rated NEMA 4X, corrosion resistant, stainless steel
Hauler Access	Industrial display with card reader and keypad
Receipt Printer	Heavy duty kiosk-style printer, illuminated chute, large capacity roll
Pedestal Base	NEMA 4X stainless steel enclosure, 60" wide. Encloses quick opening electrically actuated valve (4" or 6") and flow meter
Power	120VAC, 30 AMP
Rate of Flow	Up to 1,100 gallons per min (4,164 liters per min)
Temperature	Operating temperature range -40°F to 122°F (-40°C to 50°C)
Software	Station interfaces with PortALogic management software for record keeping, billing, monitoring, and reporting
Certifications	

TYPES OF WASTE

Septage
Fats-Oils-Grease (FOG)
Sludge
Frac Water
Other Waste



Tioga, ND

Outdoor rated card reader/keypad with sunlight visible display

Illuminated receipt paper chute



"System Ready" light

Integral "Done" and "Start" switch

DS-200 Model, can be mounted on top of pedestal base or separately



60" Pedestal Base, lockable and encloses electrically actuated valve and flow meter



PortALogic Waste Dump Station - Model DS-25

OPTIONS

Sampler	Refrigerated samplers can be included in the system
pH Transmitter	pH monitors can be included in the system
Solar Powered	Stations can be powered by solar energy for remote installations
Cold Climate Package	Heaters, insulation, and heat tracing can be added to protect the station in cold climates
Hot Climate Package	Air conditioners and sunshields can be added to protect the station in hot climates
Gate/Door Control	The station can interface with automatic gates and doors if needed

HAULER ACCESS STATION OPERATION

1.	Hauler connects truck to inlet connection
2.	Hauler turns the switch to "Start"
3.	Hauler uses wipe card or enters PIN
4.	Hauler follows display prompts and enters information such as waste type
5.	Inlet valve opens, "System Ready" light illuminates, and hauler discharges
6.	Hauler turns the switch to "Done" and a receipt is printed detailing the transaction

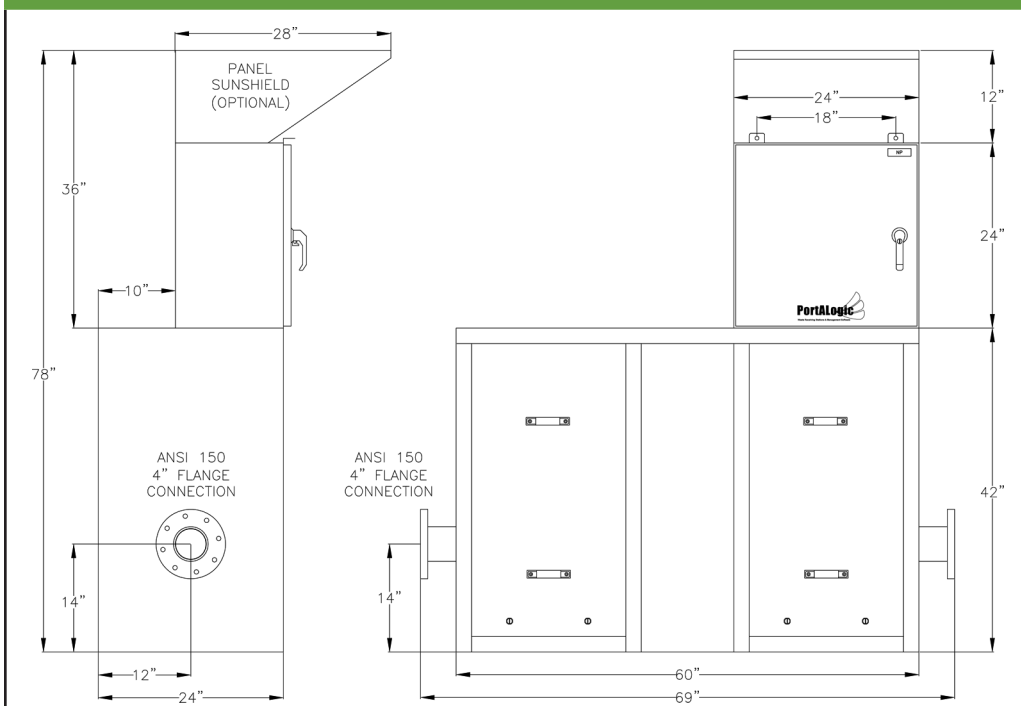
INSTALLATION

Stations come fully assembled, tested, and ready to install. The station comes with PortALogic management software which can be installed on any number of the facility's PCs.

WARRANTY

All components furnished in specification are guaranteed for two years from date of shipment. Management software updates and phone support is provided for two years from date of shipment.

DIMENSIONS



Features

- 1 Secure Hauler Login**
 - Haulers enter PIN or use swipe card to gain access
- 2 Simple to Use**
 - Display prompts guide haulers through transaction
- 3 Durable & Tamper-Proof**
 - Stainless steel, lockable doors, tamper-proof card reader/keypad
- 4 Controls Access to Valve**
 - Metered valve in base opens only to permitted haulers

PortALogic Waste Products:



DS-200

The DS-200 waste dump station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card.



DS-22

The DS-22 waste dump station is secure and controls the valve. This station includes a pedestal base enclosing an electrically actuated valve.



DS-25

The DS-25 waste dump station is secure, controls the valve, and provides metering. This station encloses an electrically actuated valve and flow meter.



DS-82

The DS-82 waste dump station is the complete solution for waste receiving. This station encloses an electrically actuated valve, flow meter, sampler, and pH sensor.



For more information about PortALogic, please contact an EleMech engineer at 630-499-7080 or visit www.portalogic.info.

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www.elemechanics.com

PortALogic

A Product of EleMech, Inc.



Management Software

Included with Each PortALogic Station

For Monitoring Stations and Managing Billing

Receiving waste into your facility or dispensing water out to haulers needs critical attention. Managing these processes irresponsibly could have adverse effects. Without an efficient process in place, it can also be costly. You see firsthand the challenges your facility faces and understand the importance of security, record keeping, and minimizing costs. Ensuring your receiving process is successful matters to you and to us.

We are EleMech, we created PortALogic stations to help you manage water and waste. Our sole mission with PortALogic is to help facilities manage water and waste responsibly while decreasing costs through our automated stations paired with our PortALogic management software. Since 1987, facilities have been looking to us to provide stations that meet their unique needs. Get started with us and let us help you meet your goals.

Buy Now - Call EleMech, Inc. at 630-499-7080 to order a station for your site

Software for Water and Waste

PortALogic seamlessly communicates with one or more PortALogic water and waste stations. It helps you manage waste receiving and water dispensing through automated record keeping and reporting. Users can see when a truck is connected, what customer is using the station, the volume, cost, and more.

SPECIFICATIONS

System	Created for Windows® XP, Windows® 7, and Windows® 8 32 or 64-bit, 1.80 GHz or higher microprocessor 2 GB RAM for XP, 1 GB of available hard disk space
Data Collected	Stores customer, truck, date, time, receipt number, volume, cost, balance, water/waste type, pH, alarms, and more
Data Storage	Data is automatically uploaded into a secure SQL database Database is easily backed-up and restored
Users	Unlimited number of software users
Integration	Manage multiple PortALogic Water and Waste Stations at separate locations with 1 centralized database
Reports	Preformatted reports can be exported as PDF, Excel document or data can be easily imported into accounting software
Networking	Ethernet or cell modem provides real-time access to data

INSTALLATION

PortALogic management software can be installed on any number of the facility's PCs. An EleMech Technical Specialist will help you with the software installation over the phone and provide an introductory software webinar.

PREFORMATTED REPORTS

Activity Reports

Revenue Reports

Customer Billing Statements

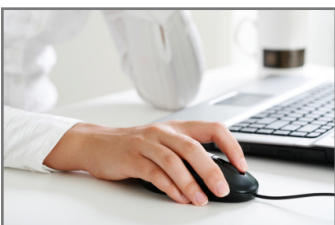
WARRANTY

Management software updates and phone support is provided for two years from date of shipment.

For Every Department

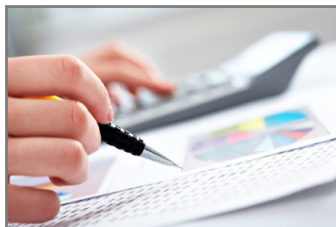
Administrators

Manage accounts and monitor stations



Accountants

Extract data and generate reports



Lab Personnel

Enter sample information



PortALogic Features

Control and Monitoring

Manage one or more stations comfortably from your office. You can activate or deactivate truck privileges, view station usage in real-time, set station hours, and more.

Customer Accounts

Easily create accounts for new customers and tie trucks to their accounts for easy tracking. Accounts can be set up on a credit or debit basis with balances automatically calculated.

Preformatted Reports

Generate preformatted activity reports, revenue reports, and customer billing statements. Reports can be exported as PDFs or Excel Documents.

Users

PortALogic can be installed on any number of computers at your facility. Set different user privileges such as read only, read and write, or admin.

Automated Record Keeping

PortALogic automatically synchronizes with the stations. Transaction details such as customer, truck, time, volume, cost, and more are stored in real-time.

Sampling

If a sampler is included with your station, you can easily set the sample frequency of all trucks or just a couple. Lab results of sampled loads can be stored in PortALogic.

Water/Waste Rates

PortALogic allows you to assign multiple water and waste type rates.

Home Screen of PortALogic

View complete customer list with account numbers and balances

See more detailed information about the selected customer

Create reports for the selected customer

Drag and drop column headers to quickly evaluate and sort data

View truck orders of selected customer with calculated charges

Switch between viewing selected customer's orders, ledger, and manifest information

The screenshot displays the PortALogic web interface. At the top, there's a navigation bar with icons for 'Add Customer', 'Add Truck', 'Add Order', 'Enter Payment', 'Refresh Data', 'Alarms', 'W/W Type', and 'Add Lab Info'. Below this, the 'Customer Information' section shows details for 'Robert Gorder' (Account 27, Address: 2275 White Oak Circle, Aurora, IL 60502, Contact: Joe Smith). To the right, 'Customer Reports' includes links for 'Statement', 'Activity', and 'Revenue'. Below the reports, there are tabs for 'Order', 'Ledger', and 'Manifest'. The 'Order' tab is active, showing a table with columns: Month, Date, Order, Station, Receipt, Truck, pH, W/W Type, Alarm, Volume, Cost, and Amount. The table lists several orders from July 13, 2013, with various trucks and calculated costs. At the bottom, a status bar indicates 'AutoRefresh is off, 1:Connected, 2:Connected'.

Month	Date	Order	Station	Receipt	Truck	pH	W/W Type	Alarm	Volume	Cost	Amount
Jul - 13	7/1/2013 2:01:28 PM	70	1	5225	2	0.1	2	4	2756	\$60.00	\$165.36
Jul - 13	7/1/2013 1:57:28 PM	69	2	5224	1	0.1	3	2	1981	\$70.00	\$138.67
Jul - 13	7/1/2013 1:51:28 PM	67	2	5222	2	0.1	2	2	2245	\$60.00	\$134.70
Jul - 13	7/1/2013 1:49:28 PM	66	1	5221	2	0.1	1	3	2527	\$50.00	\$126.35
Jul - 13	7/1/2013 1:45:28 PM	65	2	5220	1	0.1	1	1	2186	\$50.00	\$109.30
Jul - 13	7/1/2013 1:43:28 PM	64	1	5219	1	0.1	3	4	2567	\$70.00	\$119.69
Jul - 13	7/1/2013 1:39:28 PM	63	2	5218	1	0.1	1	2	2040	\$50.00	\$102.00
Jul - 13	7/1/2013 1:37:28 PM	62	1	5217	2	0.1	3	2	1643	\$70.00	\$115.01
Jul - 13	7/1/2013 1:21:28 PM	58	2	5212	1	0.1	3	4	2786	\$70.00	\$195.02
Jul - 13	7/1/2013 1:19:28 PM	56	1	5211	2	0.1	1	1	1465	\$50.00	\$73.25

PortALogic Water and Waste Products:



DS-200

The DS-200 waste dump station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card.



FS-200

The FS-200 water fill station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card.



DS-22

The DS-22 waste dump station is secure and controls the valve. This station includes a pedestal base enclosing an electrically actuated valve.



FS-22

The FS-22 water fill station is secure and manages volume. This station provides secure access and includes a pedestal base enclosing a metered valve.



DS-25

The DS-25 waste dump station is secure, controls the valve, and provides metering. This station encloses an electrically actuated valve and flow meter.



FS-82

The FS-82 water fill station is the complete solution for water dispensing. This station provides secure access and encloses a metered valve with a backflow preventer.



DS-82

The DS-82 waste dump station is the complete solution for waste receiving. This station encloses an electrically actuated valve, flow meter, sampler, and pH sensor.



For more information about PortALogic, please contact an EleMech engineer at 630-499-7080 or visit www.portalogic.info.

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Aurora, IL 60502
Office: 630-499-7080
www.portalogic.info
www.elemechanics.com

PortALogic

DUMP STATION MODELS

WITH MANAGEMENT SOFTWARE



EleMech, Inc.
2275 White Oak Circle
Aurora, IL 60502

Phone: +1 630-499-7080
www.portalogic.info

Dump Station DS-200



This simple tamper-proof model is easy for haulers to use and provides secure access by PIN or swipe card.

Starting at \$14,995

Dump Station DS-22



This model incorporates the features of the DS-200 model but also includes a pedestal base enclosing an electrically actuated valve.

Starting at \$23,995

Dump Station DS-25



This model incorporates the features of DS-22 model but also includes a flow meter for a simple turnkey solution.

Starting at \$31,995

Dump Station DS-82



This model is the complete solution for waste receiving. This dump station incorporates the features of DS-25 model and encloses a sampler and pH sensor.

Starting at \$49,995

Appendix I: Alternative Equipment Brochures and Quotes from Vendors

The Maher Corporation

THE MAHER CORPORATION

WATER & WASTEWATER PROCESS, PUMPING & VALVE SYSTEMS



192 PLEASANT STREET
ROCKLAND, MASSACHUSETTS 02370
(781) 421-2600 • FAX (781) 878-1219
www.themahercorp.com

PROCESS & PUMPING EQUIPMENT

BIOREM TECHNOLOGIES INC. – Biofiltration Systems for Odor Control including BIOFILTAIR™, BASYS™, BIOCUBE™, MYTILUS™ and SYNERGY™, Biogas Conditioning Systems

BIOWATER TECHNOLOGY – Biofiltration Systems Biological Fixed Film Technology provider, including CFAS®, CMFF®, and CFIC® - Design and Build of Complete Package Plants, New Systems and Upgrades

BOERGER – Rotary Lobe Pump, Grinders

BRENTWOOD INDUSTRIES – Polychem Systems Chain & Flight, Scum Pipes, Skimmers, SmartGuard Collector Monitoring System, SedVac Sediment Dredge System, Tube Settlers, Support Systems, Baffles and Troughs, Trickling Filter Media, Support Systems, IFAS Systems, Submerged Process Media

CALGON CARBON – Granular Activated Carbon Media, Engineered GAC Systems

CHARTER MACHINE CO. – Contract Dewatering, Belt Filter Presses, Gravity Belt Thickeners, Lime Stabilization, Rotary Drum Thickeners

CLEARSTREAM – Circular Clarifiers, Thickeners, DAFs and Rectangular DAFs for Water and Wastewater Treatment

DBS MANUFACTURING – OEM Clarifier and Thickener Drives, Direct "Bolt-In" Retrofit Drives, Low Speed Aerators and Rotary Distributors

DYNATEC SYSTEMS, INC. – Out of basin MBR systems

ECS – Odor Control Systems Specializing in Carbon Adsorbers with CALGON Carbon, Chemical Scrubbers, FRP Chemical Storage Tanks, Sound Enclosures, Covers and Buildings

ENVIRONMENTAL FABRICS INC. – Geosynthetic Liners, Lagoon Baffles, Curtains and Floating Cover Systems

FLO TREND SYSTEMS, INC. – Liquid/Solids Separation for Sludge and Grit, Container Filters, Sludge-Mate

FLYGT – Compact Mixers, Mid-Size Mixers, Slow Speed Mixers, Top-Entry Agitators

GILLTRADING.COM, INC. – WeirWasher Automated Cleaning Systems, Eco-Blaster Biological Control Systems

HAYWARD-GORDON, LTD. – Recessed Impeller Pumps, Screw Impeller Pumps, Chopper Pumps, Mixers

HEADWORKS, INC. – Headworks® Bar Screen Featuring Mahr™ Technology, MBBR Systems

HOWDEN ROOTS LLC – Positive Displacement and Centrifugal Air Blowers, EASYAIR™ RAMX2 Factory Packages, Authorized Repair Facility, Blower and Aeration Controls

KOCH MEMBRANE SYSTEMS – MBR Systems for Municipal Wastewater Treatment, Ultrafiltration, R-O and Nanofiltration Systems for Municipal Water Treatment

LAKE SIDE EQUIPMENT CORPORATION – Fine Screen, Septage Acceptance Plant, Screenings Wash Press, Complete Plant; Oxidation Ditch Aerators, Clarifiers, Screw Pumps, Rotary Distributors, Grit Removal Systems, Mixers

NEFCO – FRP Weirs, Scum Baffles and Troughs, Density Current Baffles, Launder and Channel Cover Systems

PARKSON – DynaSand Filtration, MIOX Disinfection, Lagoon Aeration, Rotary Drum Thickeners

SANITAIRE CORPORATION –

ABJ – ICEAS and SBR Systems

Sanitaire – Ceramic and Membrane Fine Bubble Diffused Aeration
Stainless Steel Coarse Bubble Diffused Aeration Systems,
Oscar Process Controls

SPIRAC, INC. – Shaftless Screw Conveyors and Systems

SYNCRIFLO – Prepackaged Water Pumping Systems

THERMAFAB – Floating Baffles, Clearwell Curtains and Portable Spill Containment Units

THERMA-FLITE – BIO-SCRUB® Biosolids Dryer for Class A Sludge Production

TROJAN TECHNOLOGIES, INC. –

SALSNE Filter – Complete Primary Treatment Systems

TROJAN UV – Ultraviolet Disinfection Systems for Water and Wastewater

USP Technologies – Hydrogen Peroxide and Peroxide Based, Full-Service Environmental Treatment Programs

UNIFILT CORPORATION – Filter Media, Removal and Installation Services and UNIFILT Air Scour Filter Media Cleaning

VAPEX – O-Mega Hydroxyl Radical Odor, Grease and Corrosion Control

WATSON-MARLOW FLUID TECHNOLOGY GROUP – Peristaltic Pumps for Sludge, Lime and Chemical Metering/Transfer Applications

WESTFALIA SEPARATOR – Centrifuges and Thickeners

PIPING, VALVES & OPERATORS

ECS – AMCA Certified FRP Damper/Ductwork Systems

EIM CONTROLS – Valve Actuators (electric, pneumatic, manual)

FELKER BROTHERS, INC. – Stainless Steel Pipe and Fitting Systems

LATANICK EQUIPMENT – Telescoping Valves and Mud Valves

PROCO Inc. – Expansion Joints, Pipe Penetration Seals, Check Valves

SINGER VALVE – Automatic Control Valves

STRAUB – Stainless Steel Couplings

WACO PRODUCTS – Slide, Weir, Stop Gates and Stop Logs, Water Control Equipment in Stainless or Aluminum

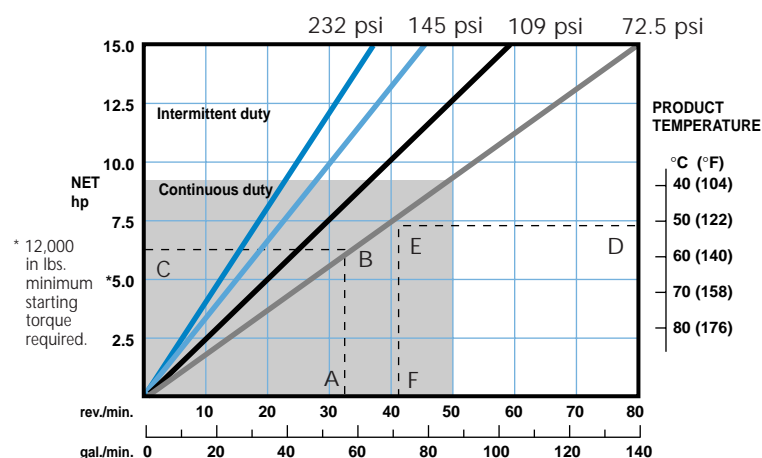


SPX65 High-Pressure Hose Pumps

Features and Benefits

- High-strength, twin-bearing hub integrated into the pumphead
- Rotor always fully and centrally supported by its own bearings
- Fail-safe shaft design
- New flat shim and improved epoxy shoe design
- Faster hose changing and improved sealing
- Easy access to shims and shoes
- Unique buffer zone provides protective barrier between pumphead and gearing
- Patented direct-coupled design
- Ultra compact planetary gearing
- No drive alignment for faster set-up
- No coupling or baseplate for compact footprint
- Adapter available for fitting hydraulic or pneumatic motors
- Improved frame design
- Increased corrosion resistance
- Compact design, low maintenance,
- Two year warranty

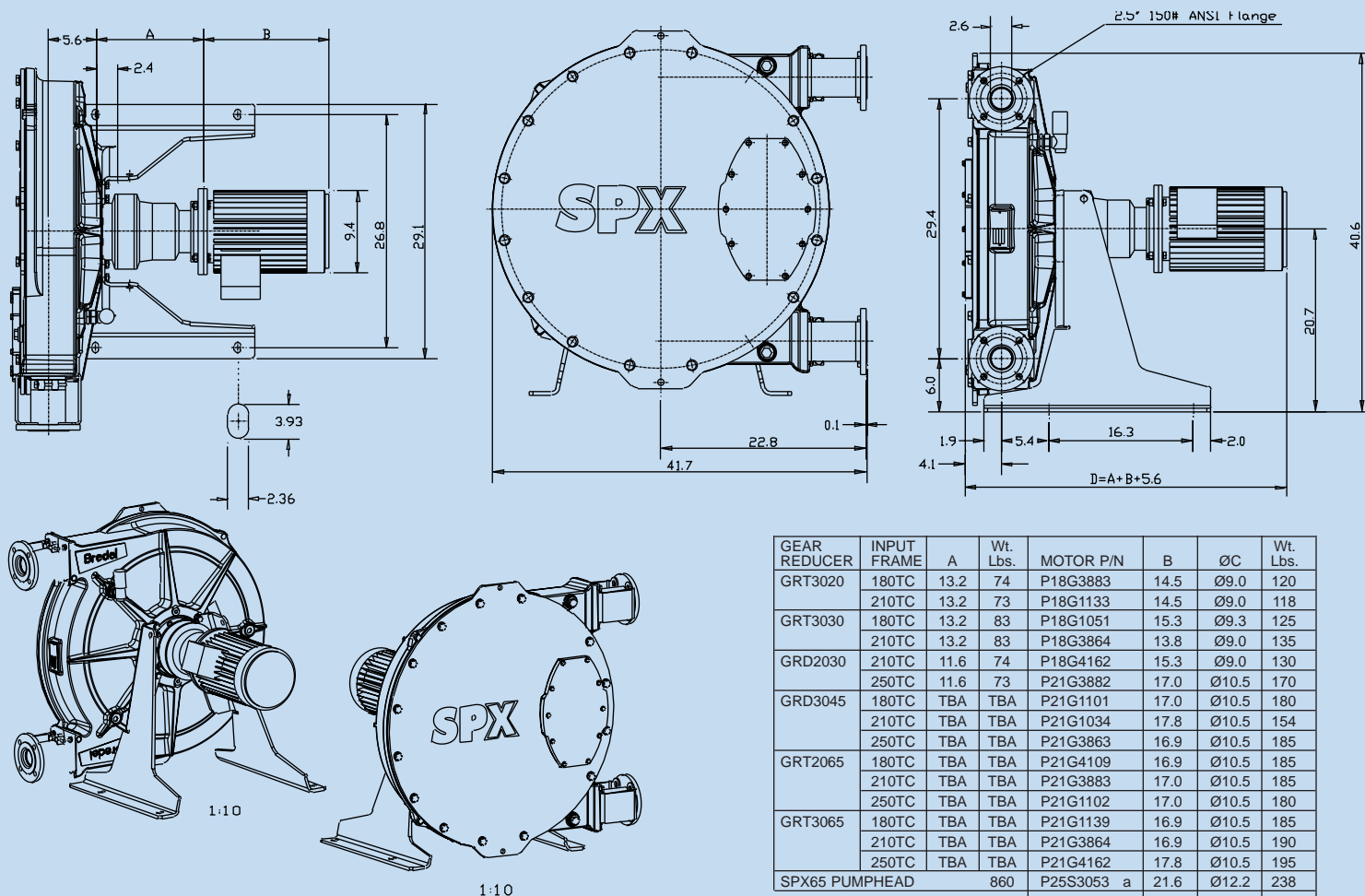
Performance Chart



How to calculate speed/horsepower

- A Flow required, indicates pump speed
- B Calculated discharge pressure
- C Horsepower required
- D Fluid temperature
- E Calculated discharge pressure
- F Maximum recommended pump speed**

** For maximum hose life, speed point (A) should be lower than temperature adjusted speed point (F). See example points (A) thru (F).



GEAR REDUCER	INPUT FRAME	A	Wt. Lbs.	MOTOR P/N	B	ØC	Wt. Lbs.
GRT3020	180TC	13.2	74	P18G3883	14.5	Ø9.0	120
	210TC	13.2	73	P18G1133	14.5	Ø9.0	118
GRT3030	180TC	13.2	83	P18G1051	15.3	Ø9.3	125
	210TC	13.2	83	P18G3864	13.8	Ø9.0	135
GRD2030	210TC	11.6	74	P18G4162	15.3	Ø9.0	130
	250TC	11.6	73	P21G3882	17.0	Ø10.5	170
GRD3045	180TC	TBA	TBA	P21G1101	17.0	Ø10.5	180
	210TC	TBA	TBA	P21G1034	17.8	Ø10.5	154
	250TC	TBA	TBA	P21G3863	16.9	Ø10.5	185
	210TC	TBA	TBA	P21G4109	16.9	Ø10.5	185
GRT2065	180TC	TBA	TBA	P21G3883	17.0	Ø10.5	185
	250TC	TBA	TBA	P21G1102	17.0	Ø10.5	180
GRT3065	180TC	TBA	TBA	P21G1139	16.9	Ø10.5	185
	210TC	TBA	TBA	P21G3864	16.9	Ø10.5	190
	250TC	TBA	TBA	P21G4162	17.8	Ø10.5	195
SPX65 PUMPHEAD		860	P25S3053 a	21.6	Ø12.2	238	
			P251029	21.1	Ø13.3	355	
			P25G3375	21.1	Ø13.3	315	
			P25G1104	21.1	Ø13.3	345	

Note: Dimensions shown are based on the standard pump and motor configuration. Overall length may vary depending on actual motor section.

SPX65 High-Pressure Hose Pumps

Technical Specifications

Supply: 115/230 single phase or
230/460 or 575 three phase

Operating Speeds: up to 50 rpm continuous
up to 80 rpm intermittent

Fluid Temperature Range: -4° to 175°F

Hose Lubricant Required: 1.5 gallons

Flow Range: 3.54 - 141.6 gpm

Discharge Pressure: up to 232 psi

Suction pressure: 28 ft. lift to 30 psi

Available Hose Materials: Natural Rubber
BUNA N BUNA K
EPDM Hypalon (pending)

Available Insert Materials: Polypropylene
316 SS
PVDF
PVC

Materials of Construction

Pumphead: Cast iron

Rotor: Cast iron

Cover: Mild steel

Hub: Cast iron

Shoes: Epoxy

Flanges and Flange Brackets: Galvanized steel or 304 SS

Frame: Galvanized steel

Hardware: Zinc plated steel or 304 SS

Shaft: Alloy steel

Shims: 316 SS

Seals: NBR

The information contained in this document is believed to be correct, but Watson-Marlow/Bredel Pumps accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WATSON
MARLOW PUMPS
Bredel

Watson-Marlow, Inc.

220 BALLARDVALE STREET, WILMINGTON, MA 01887
TEL: 800-928-7786, 978-658-6168 / FAX: 978-658-0041
<http://www.watson-marlow.com>
<http://www.bredel.com>

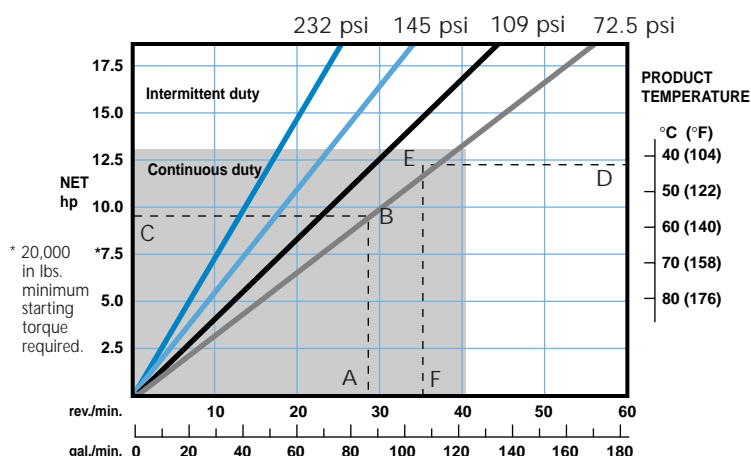


SPX80 High-Pressure Hose Pumps

Features and Benefits

- High-strength, twin-bearing hub integrated into the pumphead
- Rotor always fully and centrally supported by its own bearings
- Fail-safe shaft design
- New flat shim and improved epoxy shoe design
- Faster hose changing and improved sealing
- Easy access to shims and shoes
- Unique buffer zone provides protective barrier between pumphead and gearing
- Patented direct-coupled design
- Ultra compact planetary gearing
- No drive alignment for faster set-up
- No coupling or baseplate for compact footprint
- Adapter available for fitting hydraulic or pneumatic motors
- Improved frame design
- Increased corrosion resistance
- Compact design, low maintenance,
- Two year warranty

Performance Chart

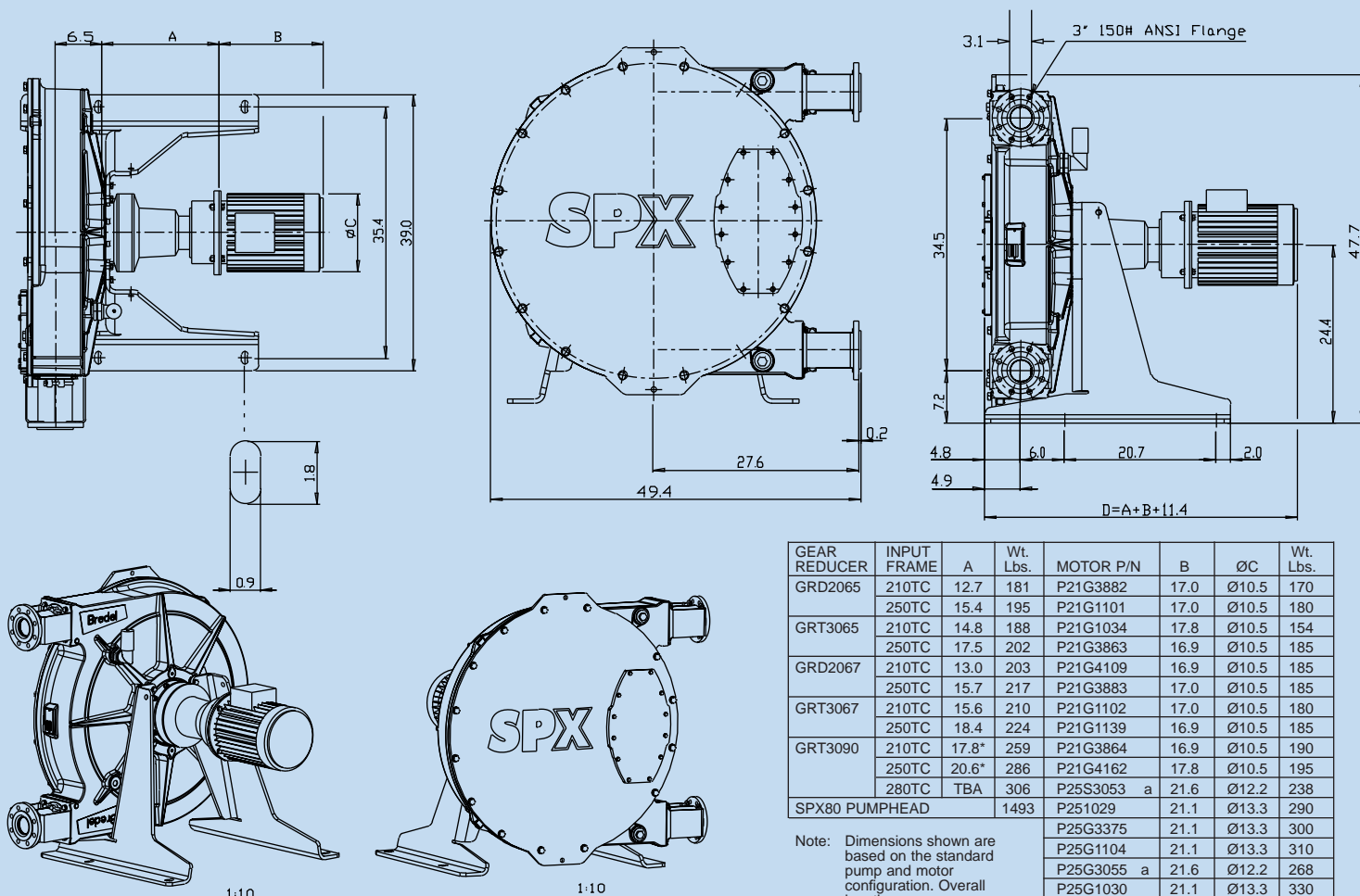


How to calculate speed/horsepower

- A Flow required, indicates pump speed
- B Calculated discharge pressure
- C Horsepower required
- D Fluid temperature
- E Calculated discharge pressure
- F Maximum recommended pump speed**

** For maximum hose life, speed point (A) should be lower than temperature adjusted speed point (F). See example points (A) thru (F).

Engineering and Technical Data



GEAR REDUCER	INPUT FRAME	A	Wt. Lbs.	MOTOR P/N	B	ØC	Wt. Lbs.
GRD2065	210TC	12.7	181	P21G3882	17.0	Ø10.5	170
	250TC	15.4	195	P21G1101	17.0	Ø10.5	180
GRT3065	210TC	14.8	188	P21G1034	17.8	Ø10.5	154
	250TC	17.5	202	P21G3863	16.9	Ø10.5	185
GRD2067	210TC	13.0	203	P21G4109	16.9	Ø10.5	185
	250TC	15.7	217	P21G3883	17.0	Ø10.5	185
GRT3067	210TC	15.6	210	P21G1102	17.0	Ø10.5	180
	250TC	18.4	224	P21G1139	16.9	Ø10.5	185
GRT3090	210TC	17.8*	259	P21G3864	16.9	Ø10.5	190
	250TC	20.6*	286	P21G4162	17.8	Ø10.5	195
	280TC	TBA	306	P25S3053 a	21.6	Ø12.2	238
SPX80 PUMP HEAD			1493	P251029	21.1	Ø13.3	290
				P25G3375	21.1	Ø13.3	300
				P25G1104	21.1	Ø13.3	310
				P25G3055 a	21.6	Ø12.2	268
				P25G1030	21.1	Ø13.3	330
				P25G3376	21.1	Ø13.3	310
				P25G1105	21.1	Ø13.3	345
				P28S3052 a	24.0	Ø14.3	350
				P28G511-mod	TBA	TBA	400
				P28G1048	22.8	Ø14.9	425

Note: Dimensions shown are based on the standard pump and motor configuration. Overall length may vary depending on actual motor section.

* Estimated dimension

SPX80 High-Pressure Hose Pumps

Technical Specifications

Supply: 115/230 single phase or 230/460 or 575 three phase
 Operating Speeds: up to 40 rpm continuous up to 50 rpm intermittent
 Fluid Temperature Range: -4° to 175°F
 Hose Lubricant Required: 10.8 gallons
 Flow Range: 6.2 - 182 gpm
 Discharge Pressure: up to 232 psi
 Suction pressure: 28 ft. lift to 23 psi
 Available Hose Materials: Natural Rubber
 BUNA N BUNA K
 EPDM Hypalon (pending)
 Available Insert Materials: Polypropylene
 316 SS
 PVDF
 PVC

Materials of Construction

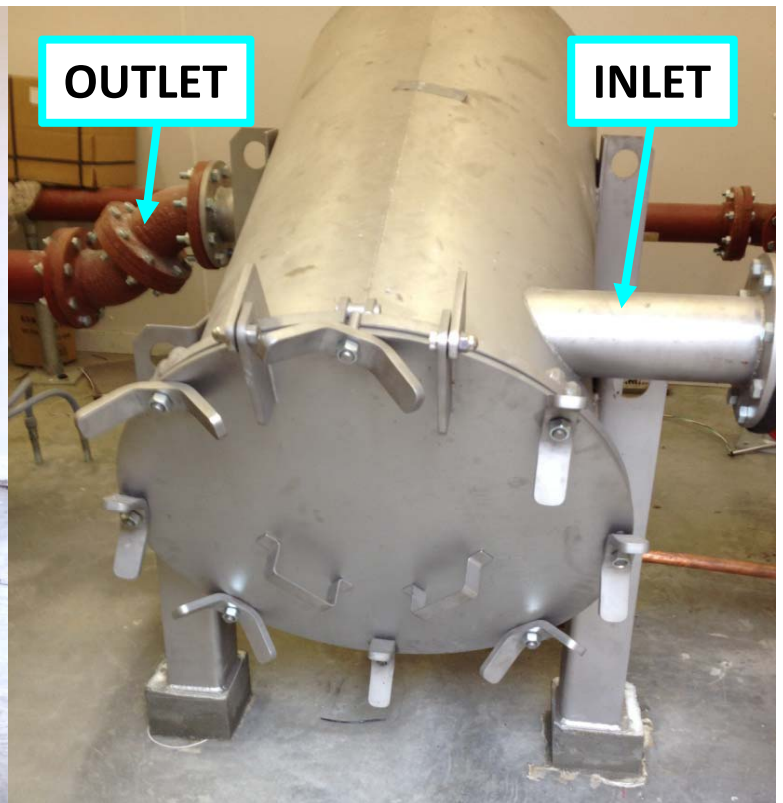
Pumphead: Cast iron
 Rotor: Cast iron
 Cover: Mild steel
 Hub: Cast iron
 Shoes: Epoxy
 Flanges and Flange Brackets: Galvanized steel or 304 SS
 Frame: Galvanized steel or 304 SS
 Hardware: Zinc plated steel or 304 SS
 Shaft: Alloy steel
 Shims: 316 SS
 Seals: NBR

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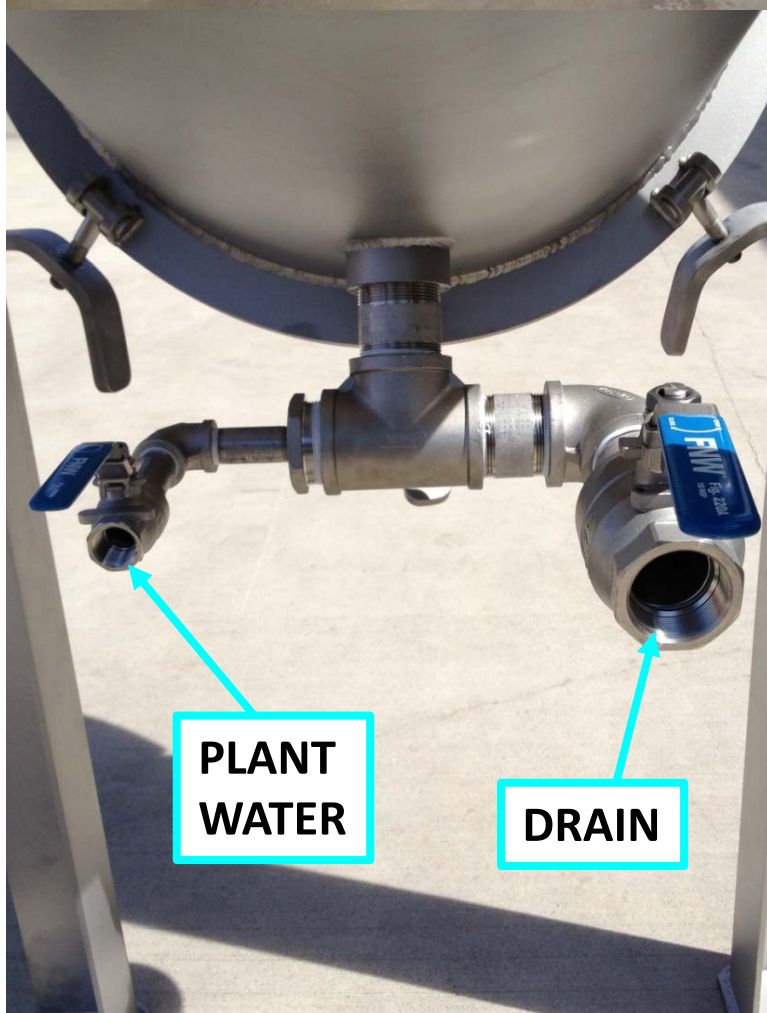
WATSON
MARLOW PUMPS
Bredel

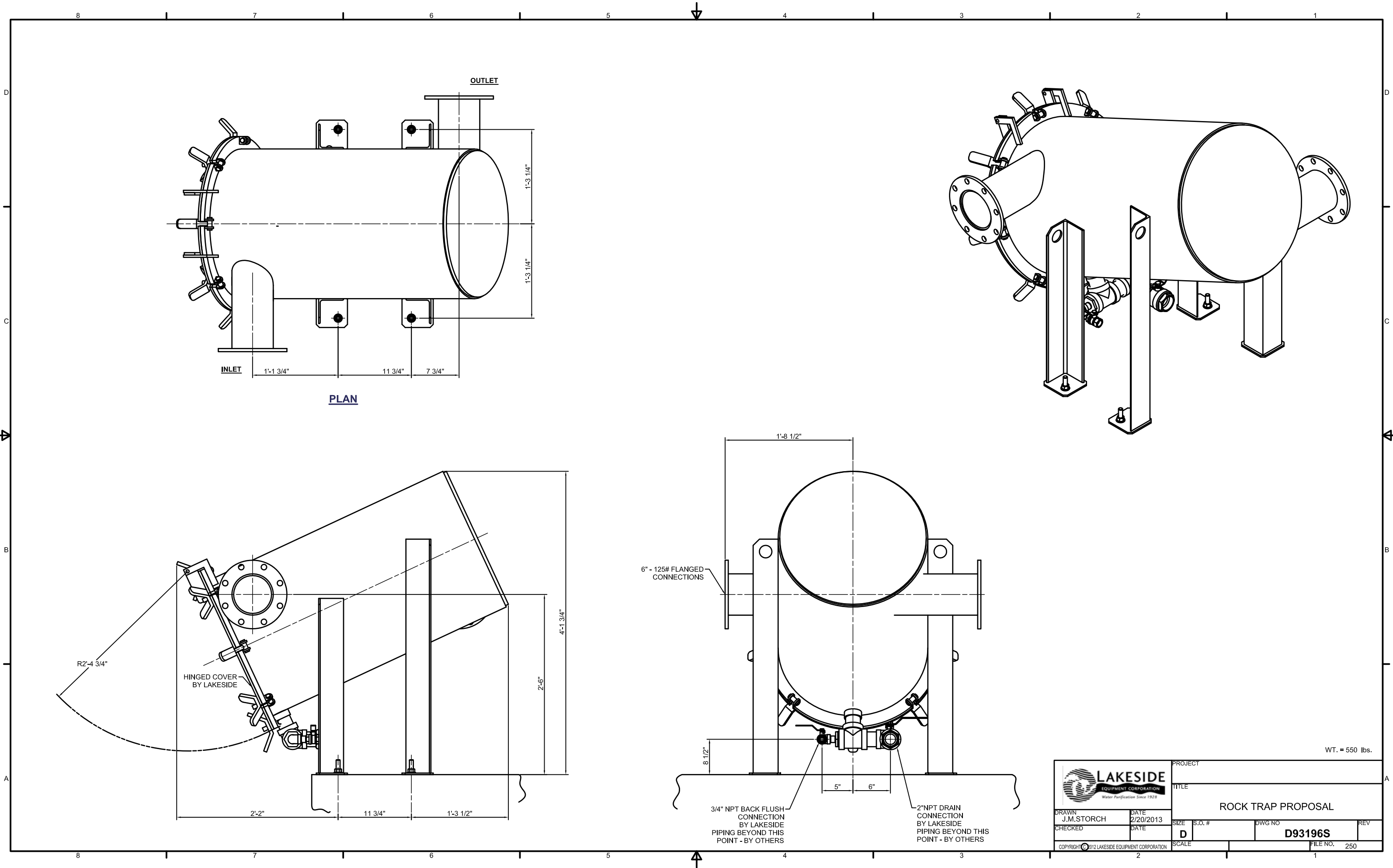
Watson-Marlow, Inc.

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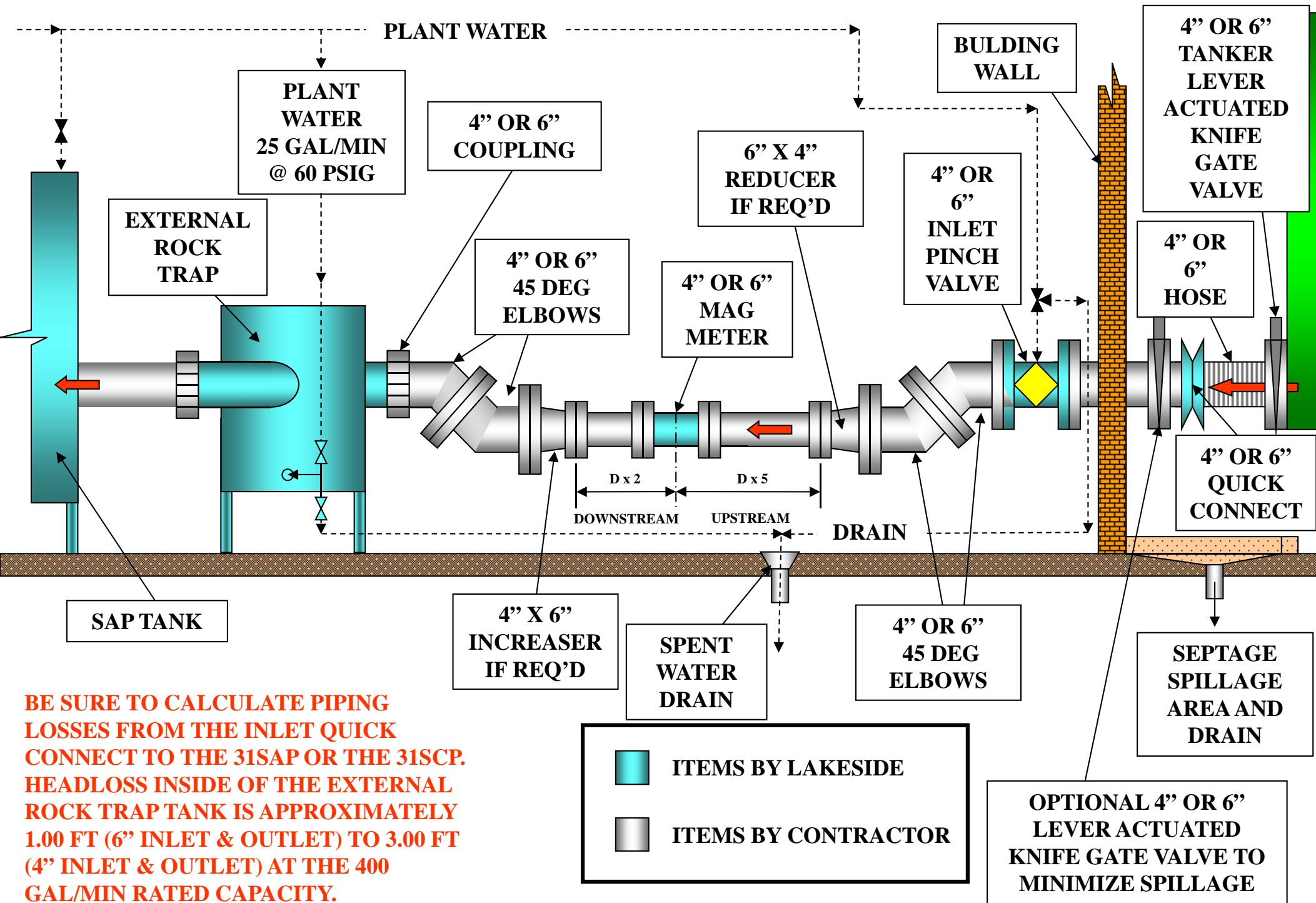


Type "K" External Rock Trap





SAP FLOW METER - ROCK TRAP PIPING



Enviro-Care



FLO-Beast Liquid Waste Receiving System

VFA-DM-HS

With Hauler Station - Access Panel - Flo-Logic® Software

Fully integrated, secure, 24/7 operation and the next generation of septage screening.



A System Designed Specifically for Septage Pre-treatment

This system is made up of three different components. The Braun, the Integrator and the Brains.

The Flo-Beast SeptageStation DM is the Braun of this system. It screens the heavy solids from the septage and conveys, washes, and dewater those solids prior to discharge. The Beast does not require a rock trap or other high maintenance add-ons, such as grinders.

Both the screen and tank have been designed to eliminate the problems that plague other equipment currently available for septage applications. The result is fast truck unloading times and high capture efficiency.

Between the Beast and the Brains, is the Integrator hauler station. The hauler station controls and monitors the flow of septage between the truck and the screen.

The hauler access panel is connected to the hauler station and contains the Brains of the system - the Flo-Logic® software.



The Hauler Station

- Electrically actuated inlet valve
- Magnetic flow meter
- Hauler access panel
- Flo-Logic® software

The Brains - Flo-Logic® Software

Security

- Provides 24/7 access to permitted haulers.

Data Logging

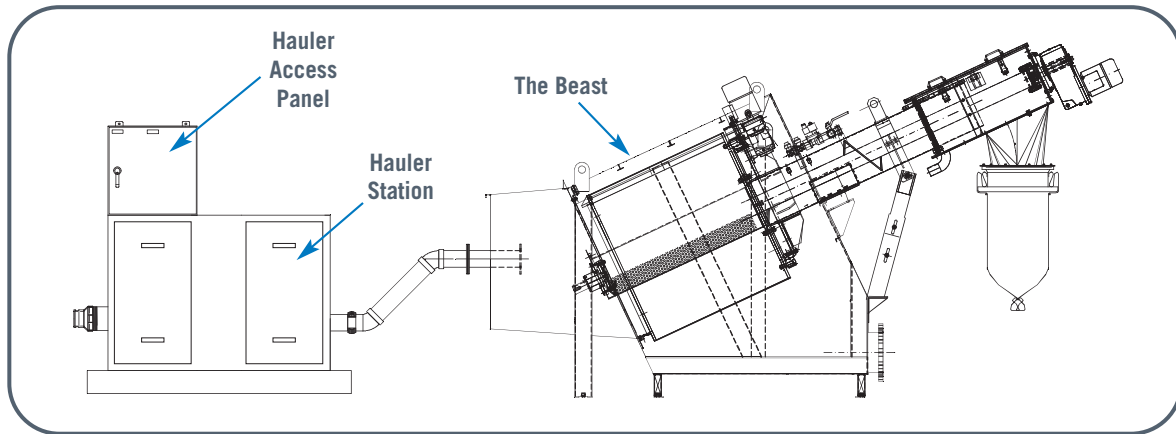
- Automatically collects data regarding trucks and septage loads.

Reporting

- Provides data sorting capabilities, report generating and billing information.
- Simple network connections.
- Can be WiFi enabled for data transfer to remote locations.

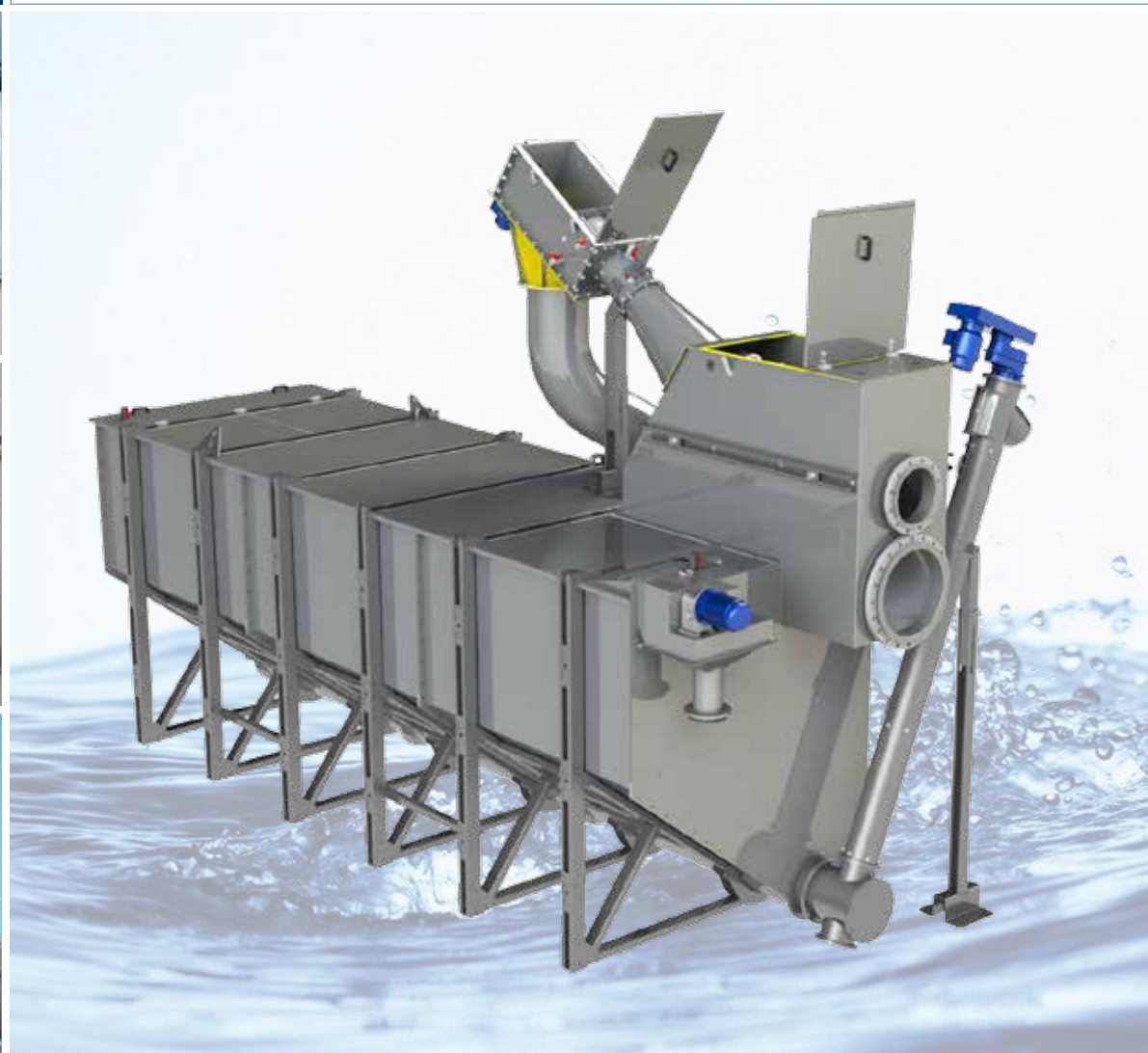


Key card activated.



Kershaw County South Carolina Septage Receiving Station.

Municipal and Industrial Waste Water
Mechanical Pre-treatment
WASTEMASTER® TSF 2-3



WASTEMASTER® TSF consists of a screw screen, a sedimentation tank, a sand extracting screw and a grease scraper.

	Solids Separation	Sedimentation	De-greasing
TSF 2	X	X	-
TSF 3	X	X	X

The first phase in the waste water treatment process is mechanical pre-treatment including:

- Solid-liquid separation, compaction and de-watering of solids larger in size than the screen slots;
- Sedimentation, lifting and de-watering of sand;
- Grease flotation and removal (TSF 3 only).

Subsequently the waste water is ready for further treatment (chemical, physical or biological), while solids are discharged for disposal.

Features

WASTEMASTER® TSF is designed for a wide range of waste water flow rates with different sedimentation capacities.

The possibility to choose the size of the screen perforation/slots, as well as cross section and length of the tank, is the assurance for the customer that he will obtain the right solution to his problem.

The machine comes in high-quality, industrially manufactured, standard modules, ready for comfortable on-site assembly if requested.

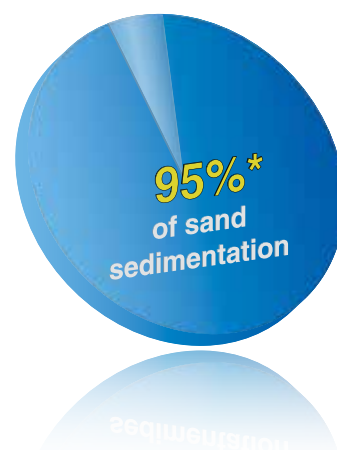
The screen section of the plant is equipped with a compacting device in the upper part for a volume reduction of the screenings of up to 35%. A washing system for the reduction of organic matter in the screenings is available on request.

The shaftless screen screw, which is manufactured in an innovative, patented process, ensures smooth operation without clogging even in presence of fibres.

The table below shows an example of how to choose the correct machine according to the requested sedimentation output rate.

TSF 2/3			FLOW RATE *	
Size	Module	Tank lenght (m)	Min (l/s)	Max (l/s)
S 1 0	1	2	5	13
S 2 0	2	4	12	30
M 1 0	2	4	25	39
M 2 0	3	6	35	60
M 3 0	4	8	60	85
L 1 0	4	8	80	115
L 2 0	5	10	110	145
L 3 0	6	12	140	175
L 4 0	7	14	170	205

* with a grain size of 0.2 mm and a Specific Gravity of 2.60-2.65 w/v

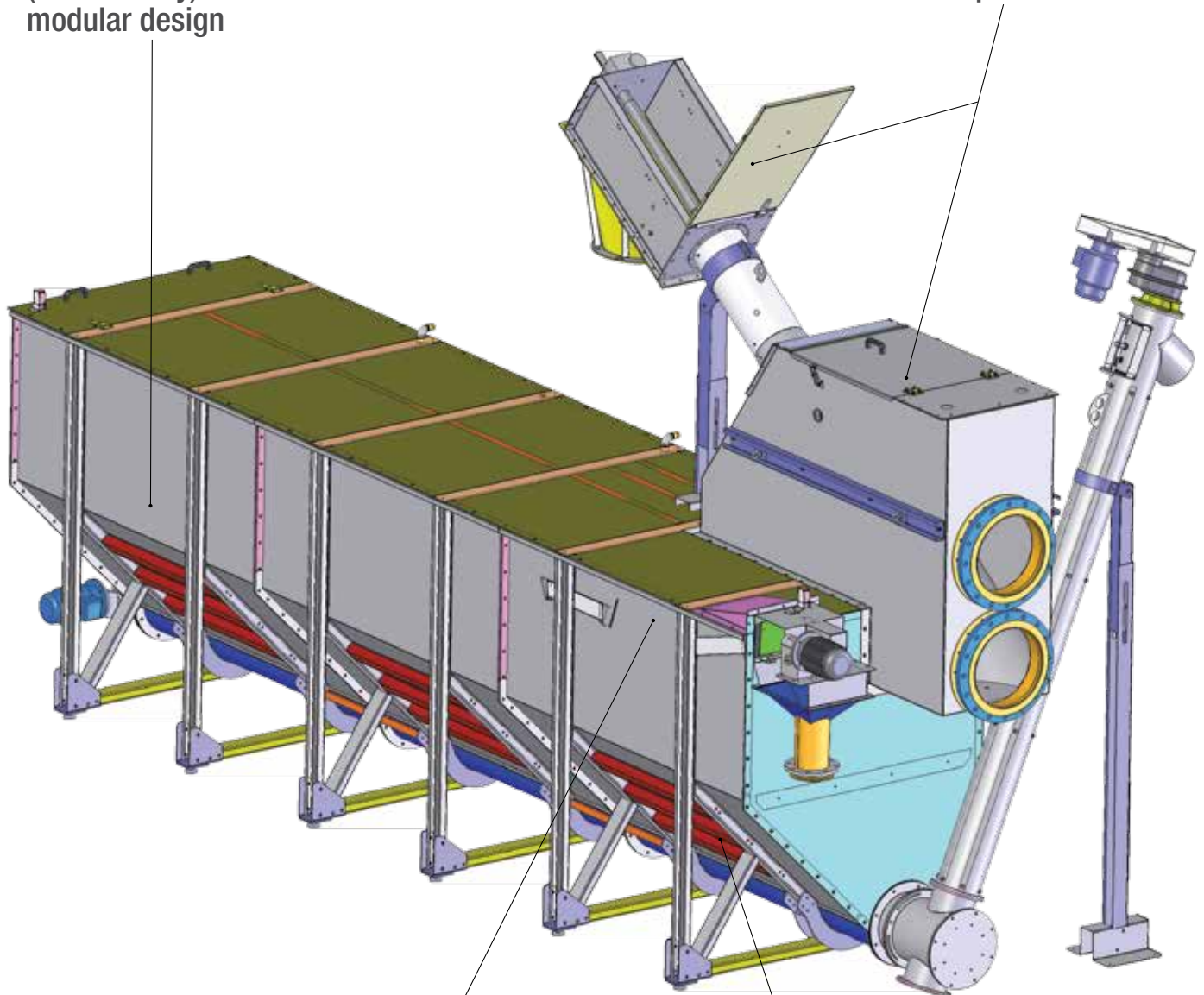




Easy on-site assembly
(if necessary) thanks to
modular design



Easy maintenance thanks
to wide inspection hatches



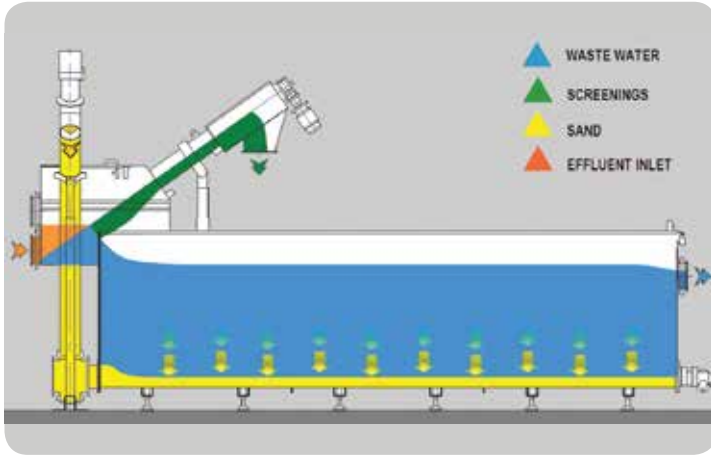
Self-adjusting grease scraper
with limited water removal



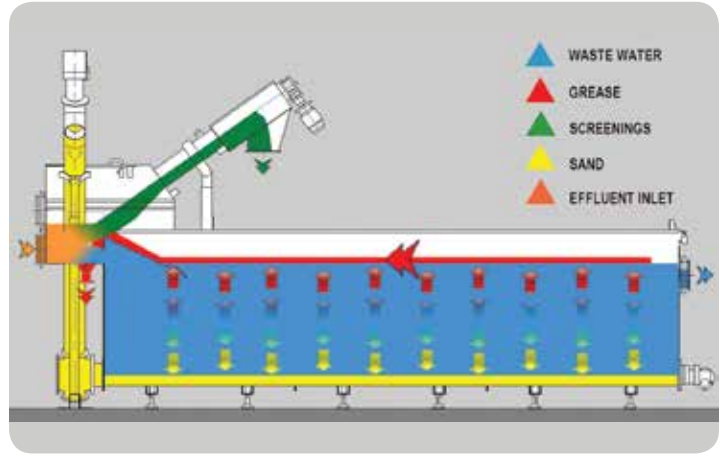
Bolted wear bars
(internal view of trough)

Process Description

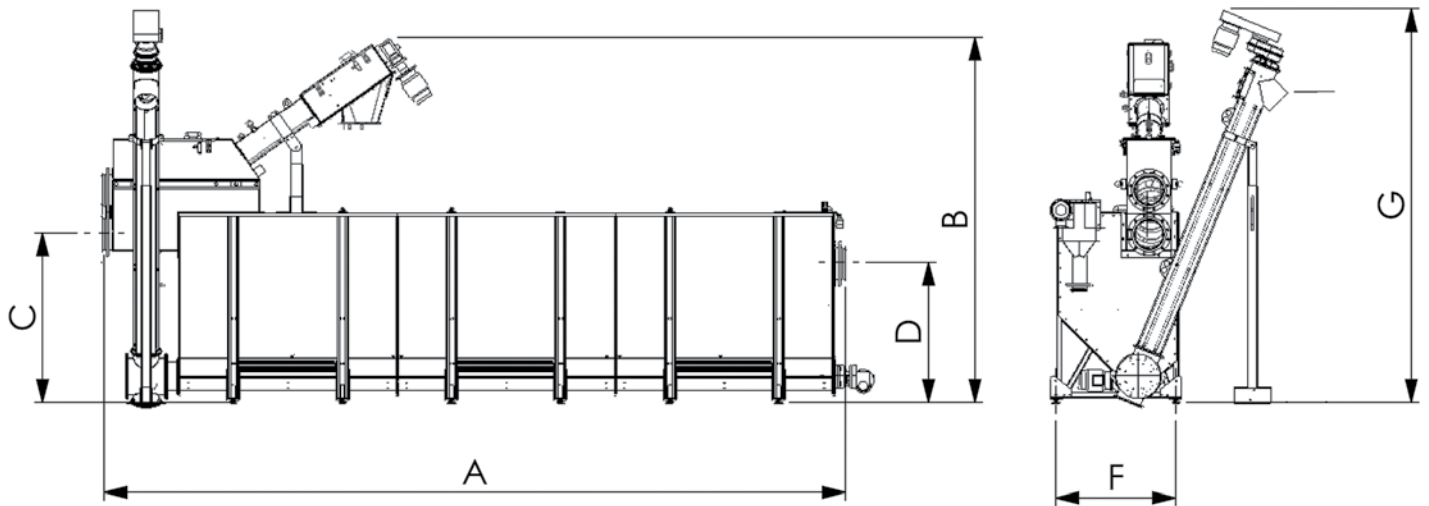
TSF 2



TSF 3



Overall Dimensions



Type	A	B	C	D	F	G
TSF S 10	2,850	3,350	1,550	1,280	1,100	3,610
TSF S 20	4,850	3,350	1,550	1,280	1,100	3,610
TSF M 10	4,830	4,000	1,780	1,460	1,420	3,900
TSF M 20	6,830	4,000	1,780	1,460	1,420	3,900
TSF M 30	8,830	4,000	1,780	1,460	1,420	3,900
TSF L 10	8,820	4,630	2,310	1,750	1,940	4,270
TSF L 20	10,820	4,630	2,310	1,750	1,940	4,270
TSF L 30	12,820	4,630	2,310	1,750	1,940	4,270
TSF L 40	12,820	4,630	2,310	1,750	1,940	4,270

Dimensions in mm

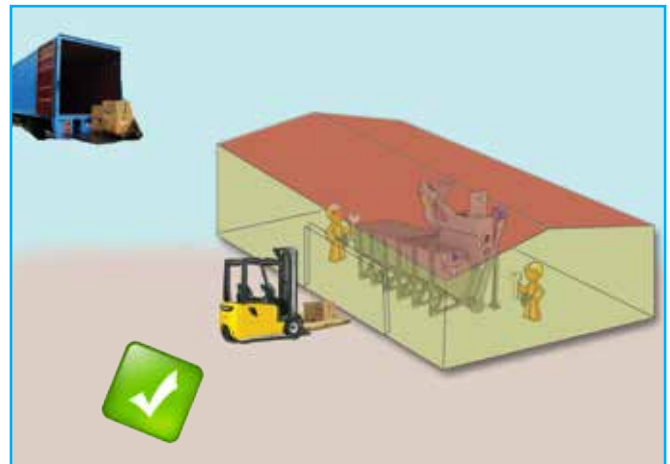
Benefits

- ✓ Decreased infrastructure costs;
- ✓ Easy on-site machine assembly using standard tools → Reduction of intermediate storage costs;
- ✓ Best footprint-net volume ratio for this type of machine;
- ✓ Durable heavy-duty shaftless screws manufactured in patented process;
- ✓ Self-adjusting scraper device (patent pending) → Limited water removal in any flow condition.

Easy on-site machine assembly
using standard tools

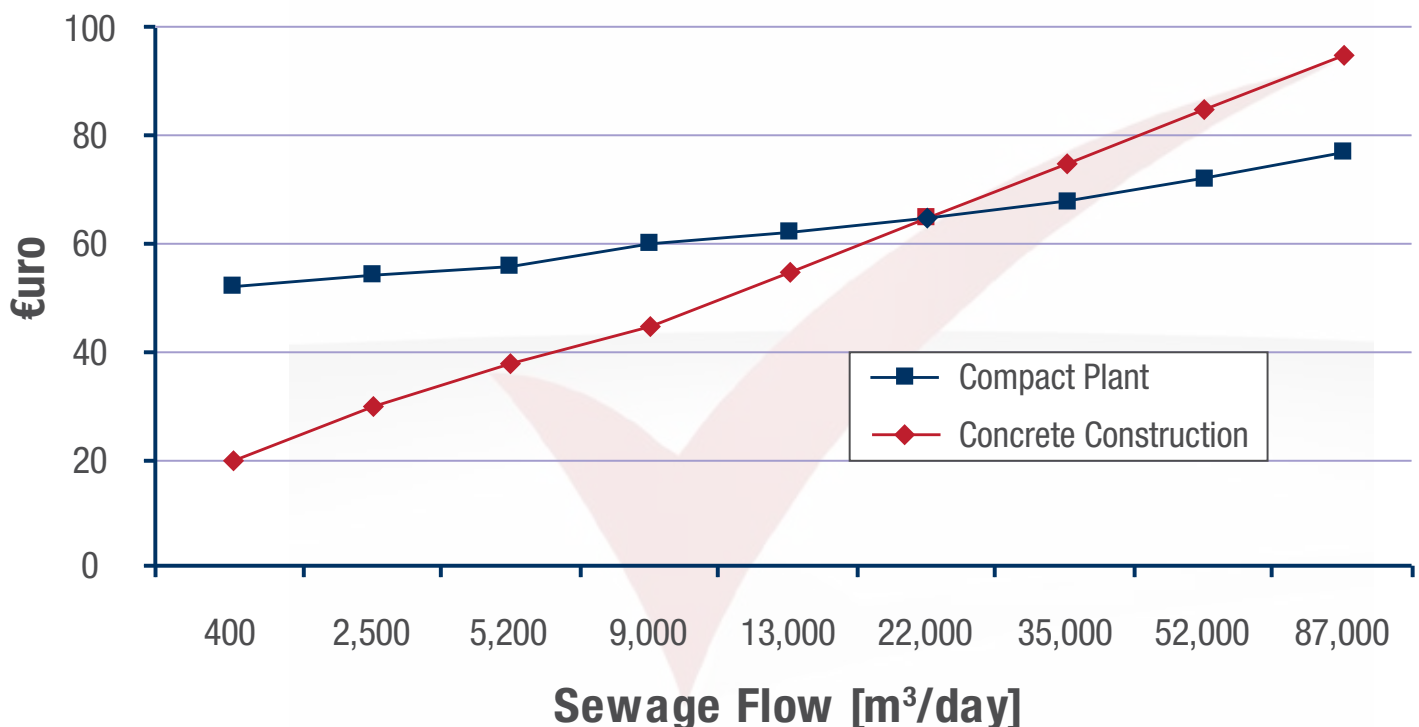


Reduction of intermediate
storage costs



Return On Investment - Life Cycle Cost Calculation Over 15 Years

Life Cycle Cost Comparison between
WASTEMASTER® TSF and traditional concrete construction



Application



 **Enviro-Care**
A WAMGROUP® Company

1570 St. Paul Avenue
Gurnee, IL 60031 U.S.A.
P: 815.636.8306

ecsales@Enviro-Care.com
www.Enviro-Care.com



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UNI EN ISO 9001
Certified Company

www.wamgroup.com

WASTEMASTER® COMBI

Combined Pre-Treatment Plant

TSF-3



SPECO®



4.5 MGD WASTEMASTER® COMBI Plant



SPEC®

WASTEMASTER® COMBI TSF-3

Combined Pre-Treatment Plant

A Self-Contained Pre-Packaged Treatment Plant with Solids Screening, Grit Removal and Degreasing.



200 GPM SPEC OCOMBI Plant

The WASTEMASTER COMBI is a complete, above-ground headworks requiring minimal space and civil works. The COMBI can be the only pre-treatment for a small plant or a way to increase pre-treatment capacity or avoid overloading of downstream processes in any size plant. The standard SPEC® design utilizes a WASTEMASTER GCP screw screen. However, other screens types such as rotating drum or multirake screens are an option depending on the application.

With over 10-years of experience and 500 installation worldwide, SPEC's application and technical knowledge insures proper sizing and component selection for each specific applications. The unique modular design allows the SPEC COMBI to be configured for standard and specialized pre-treatment applications. The COMBI can be found processing wastewater, sludge, FOG and septage.

Features

- Compact, modular design.
- Best foot print / net volume ratio.
- Volume reduction of solids up to 40%.
- Long lasting, heavy-duty screws.
- Proprietary floating scraper.
- Above ground installation.
- Requires little space and minimal civil works.
- Low investment and maintenance costs.
- Sectional, durable polymer brushes for long life and ease of maintenance.
- Can be assembled on site.



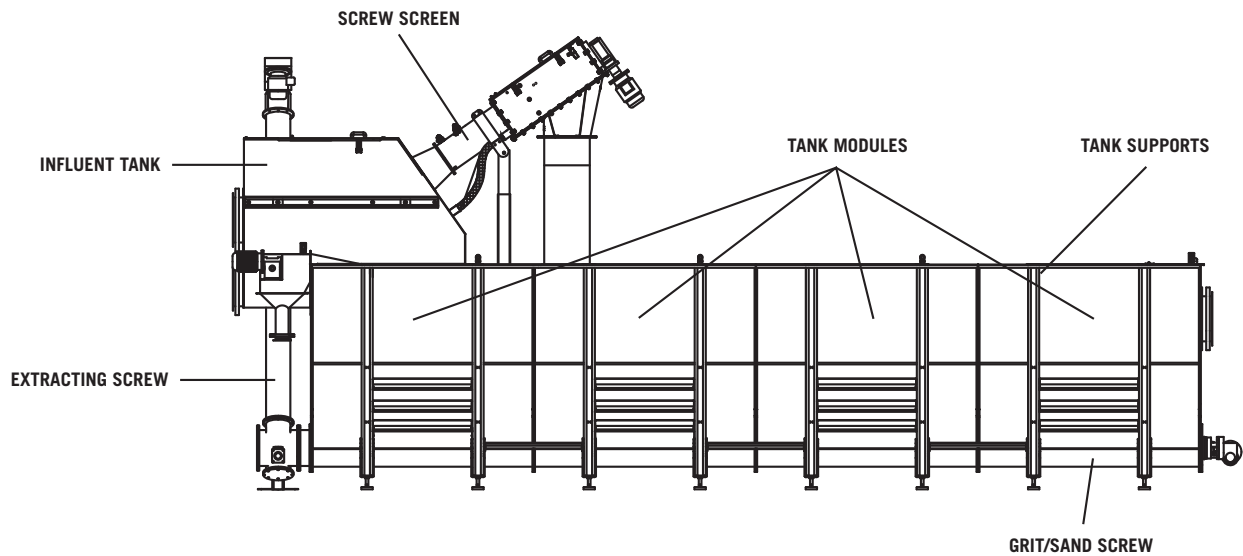
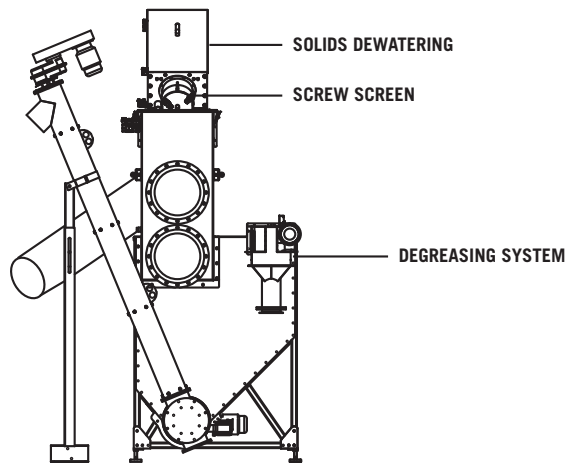
Dual Headworks COMBI Units



500 GPM SPEC OCOMBI Plant



SPEC0® WASTEMASTER® COMBI configured as a septage receiving station.



Technical Information

Flow Rates From	150 gpm to 4.8 MGD
Sand Separation	95% Capture of Particle Size ≥ 0.2 mm
Standard Tank Widths	3.6 ft., 5 ft. and 6.5 ft.
Standard Tank Lengths	6.5 ft. to 39 ft.
Perf screen Openings	2, 3, 5, 6 and 10 mm
Wedgewire Openings	0.5, 1 and 2mm

Standard Wastewater Flow Rates

Model	Flo Rate
S 10	200 GPM
M 10	618 GPM
M 30	1.9 MGM
L 20	2.7 MGM
L 30	4.8 MGM

Budget Proposal

Project:

Pease Tradeport, NH

Equipment:

SAVI Flo-Beast Septage Receiving Station
SPECO WasteMaster Combination Plant

Represented By:

Wescor Associates, Inc.

Mark Dowdell

Phone: 508-384-8921

Email: mark@wescor1.net

Regional Sales Manager:

Enviro-Care

Jesus Rodriguez

Phone: 224-302-0305

Email: jrodriguez@enviro-care.com

Project No.: WEC216086

March 1, 2016



1570 St. Paul Avenue - Gurnee IL 60031
P: 815.636.8306
F: 847.672.7968
www.enviro-care.com



ITEM: "A" - One (1) Flo-Beast Septage Receiving Station Model FSR-1200-DM



BASIS OF DESIGN

Number of Units:	One (1)
Application:	Septage, Sludge and FOG Receiving
Influent Solids Concentration:	2-3%
Peak Flow:	650 gpm
Max Clean Water flowrate:	5700 gpm
Screen Perforated Opening:	6 mm
Nominal Screen Basket dia.:	47 inches
Nominal Screw Conveyor dia.:	10 inches
Drive motor HP:	2 HP
Spray wash water requirement:	43 gpm @ 60-80 psi
Inlet pipe size:	4 inch flanged
Outlet pipe size:	10 inch flanged

DESCRIPTION OF EQUIPMENT:

- Fully automatic, self-cleaning, dual drive, septage receiving system incorporating a perforated plate rotating drum screen and an integral screenings washing, conveying and dewatering/compacting contained within a stainless steel tank.
- The septage receiving unit shall be a dual drive system which allows the drum and screw to be driven independently.
- A cylindrical drum screen shall be constructed of perforated plate media in type 304 stainless steel with 6mm perforations around the entire basket.
- The drum screen shall be mounted on the drive end using a large diameter, single row, heavy duty industrial slewing ring bearing assembly with integral ring gear comprising part of the screen drive system.
- Drum gear reducer drive unit with 2.0 HP TEFC motor suitable for 460/3/60 electrical supply.
- The tank mounted rotating drum screen, conveying and dewatering system shall be positioned at a 25° angle of inclination from horizontal.
- A cleaning brush and spray bars shall be located on the outside of the screen drum to prevent small solids from passing through the screen.
- Angled lifting vanes shall be positioned inside the drum screen to retain and lift solids into the screw trough.

- The screw trough shall extend beyond the drum screen opening at the influent end to maximize solids capture and reduce screenings recycle.
- The drive assembly for the screw shall be attached via a drive support flange welded to the upper end of the screenings transport tube.
- Screw drive unit with 2.0 HP TEFC motor suitable for 460/3/60 electrical supply.
- The shafted screenings screw conveyor to be constructed from high strength alloy steel with a two part epoxy coating.
- Compaction zone integral to the screw conveyor and with latched, hinged cover from type 304 stainless steel and safety interlock switch.
- Dewatering zone drain flush spray system from type 304 stainless steel with manual ball valve.
- Transport tube spray system from type 304 stainless steel and rubber hose with manual ball valves.
- The septage receiving unit shall be supplied with a two-stage tank. The inlet section of the tank shall slope toward the screen to prevent sedimentation. The second stage of the tank shall house the rotating drum screen.
- Tank flush wash system from type 304 stainless steel with manual ball valves.
- All covers will be gasketed and either hinged, bolted or latched.

HARDWARE (EACH)

- Assembly fasteners from type 304 stainless steel.
- Anchor rods from type 304 stainless steel.

CONTROL PANEL AND INSTRUMENTATION (EACH)

- One (1) NEMA 4X type 304 stainless steel wall mount main control panel suitable for 480/3/60 electrical supply. Control panel shall contain the following control devices for operation of the Beast unit.
 1. Main disconnect with through door interlock handle.
 2. Control Power Transformer, 480-120VAC w/branch circuit protection.
 3. Surge Protection Device, 120 VAC.
 4. Motor starter w/ overload (drum motor)
 5. Motor starter, reversing w/ overload (screw motor)
 6. Load monitor (screw motor).
 7. Pilot lights, (Motor Run & Fault, Control Power, High Water Level).
 8. Push buttons (E-Stop, System Reset).
 9. Selector Switches (Motor HOA, Wash Solenoids HOA).
 10. Programmable Logic Controller, Allen-Bradley MicroLogix, with Ethernet and Required IO.
 11. Operator Interface Unit, Allen Bradley Panelview C400.
 12. Panel Heater, with Thermostat.
 13. Load selector switch.
 14. Reset pushbutton.
 15. UL Label.

- One (1) NEMA 4X Safety Microswitch: 120 volt safety interlock switch shall be factory mounted to the compaction/discharge zone access door. Interlock switch shall prevent operation of the screen while the door is open.
- Three (3) NEMA 4X brass body solenoid valves to control flow to the spray wash assemblies. Each valve shall be NEMA 4x 120 volt, single phase, 60 Hz.
- Level control: Provide conductivity rods controlled by an intrinsically safe relay.

SPARE PARTS (TOTAL)

- None.

FIELD SERVICE (TOTAL)

- Site service of one (1) trips of two (2) days for installation inspection, startup and operator training.

CLARIFICATIONS/COMMENTS

- None.

OPTIONAL ITEMS

- Item A-1: Hauler Station: The manufacturer shall provide a secured Hauler Access Station that shall identify waste haulers and be configurable to interface with associated equipment such as doors, gates, valves, samplers, and screens & washers.
 1. Enclosure, NEMA 4X Stainless Steel
 2. Internal Swing-out Door (Stainless Steel)
 3. Lockable Full-Grip Handle with 3-Point Latch
 4. Drip Shield
 5. Access Keypad / Card Reader with 100 cards
 6. Programmable Logic Controller, Allen-Bradley MicroLogix, with Ethernet and Required IO.
 7. Printer Interface
 8. Detachable Terminals
 9. Non-Volatile Memory
 10. Compact Thermal Printer with Integral Auto-cutter Backlit Receipt Dispenser
 11. RS232 and USB Data Port
 12. Pilot Devices
 13. Full Flo-Logic Hauler Management Software including the following features:
 - The data from each hauler transaction shall be collected and stored in a secure SQL database. The following data shall be collected:
 - Site ID
 - Station ID
 - Ticket Number (*On Hauler Receipt*)
 - Hauler ID
 - Date and Time of Transaction

- Volume Unloaded
- Waste ID
- Alarm ID
- The software shall allow the facility to manage each customer, who shall receive a Hauler ID number or magnetic swipe card and 4-digit PIN number for each truck. PIN number assignment can be unique per truck or common to multiple trucks, depending on the facility and customer preference. The software shall allow the administrator to manually assign PIN numbers to trucks.
- The software shall allow the facility to enable or disable a truck's access privilege. Once disabled, a hauler's access will immediately be denied at all sites. A message shall be displayed at log-in at the hauler station informing the hauler to contact the office.
- The software shall allow the facility to define the Hauler Access Station's operating time schedule. If the station is closed, a message will alert the hauler that the station is closed.
- The software shall have a pre-formatted reporting feature that will, at a minimum, show activity with daily totals and truck usage. The reports shall be easily exported into an Adobe PDF, Microsoft Excel spreadsheet, or Word document.
- One (1) 4-inch flanged electrically actuated Gate Valve.
- One (1) 4-inch Flow meter, NEMA 4X rated with integral mount transmitter.
- One (1) Base station enclosure, NEMA 4X Stainless steel enclosure with locking access doors, contains gate valve, flow meter and necessary piping.
- Site service of one (1) trips of two (2) days for administrative training, field configuration and testing of the software system.
- Item A-2: Outdoor Freeze Protection - Weather protection system. Wash water piping wrapped with self-regulating heat trace cable supplied with insulation and protective jacket. Electrical wiring routed to a factory mounted conduit box for field connection. Includes One (1) NEMA 4X ambient temperature thermostat to control heat tracing and GFCI circuit breaker mounted in the control panel.
- Item A-3: Continuous Bagger Assemblies to collect dewatered screenings at discharge point with refillable bag cassette.

NOTE: ANY ITEM NOT LISTED ABOVE TO BE FURNISHED BY OTHERS.

EXCLUSIONS

Taxes, electrical wiring, conduit or electrical equipment, piping, valves, or fittings, shimming material, lubricating oil or grease, shop or field painting, field welding, erection, hoist or lifting apparatus, detail shop fabrication drawings, performance testing, unloading, storage, concrete work, civil design, grating, platforms, stairs, hand railing, dumpster (except as specifically noted).

This proposal section has been reviewed for accuracy and is approved for issue:

By: Chris Kincaid Date: March 1, 2016

ITEM: "A" - One (1) SPECO
WasteMaster® Combination
Plant Model TSF2-M20 BEAST



BASIS OF DESIGN (EACH)

Application:	Septage, FOG and Sludge Receiving with Grit Removal
Influent Solids Concentration:	2-3%
Peak Flow:	650 GPM
Screen Opening:	6 mm
Opening Type:	Perforated
Angle of Inclination:	35 degrees
Spray wash water requirement:	43 gpm @ 60-80 psi

Grit Capture at Maximum Flow Of 2.65 SG Grit:	95% of grit 70 Mesh and greater in size
--------------------------------------------------	-----------------------------------------

Tank Length:	23.3 feet
Tank Width:	5.0 feet
Tank Height:	6.8 feet

Inlet Flange Size:	14 inch
Effluent Flange Size:	14 inch
Air Requirements:	25 SCFM at 3-5 PSI

FINE SCREEN (EACH)

- Fully automatic, self-cleaning, dual drive, septage receiving system incorporating a perforated plate rotating drum screen and an integral screenings washing, conveying and dewatering/compacting contained within a stainless steel tank.
- The septage receiving unit shall be a dual drive system which allows the drum and screw to be driven independently.
- A cylindrical drum screen shall be constructed of perforated plate media in type 304 stainless steel with 6mm perforations around the entire basket.

- The drum screen shall be mounted on the drive end using a large diameter, single row, heavy duty industrial slewing ring bearing assembly with integral ring gear comprising part of the screen drive system.
- Drum gear reducer drive unit with 2.0 HP TEFC motor suitable for 460/3/60 electrical supply.
- The tank mounted rotating drum screen, conveying and dewatering system shall be positioned at a 25° angle of inclination from horizontal.
- A cleaning brush and spray bars shall be located on the outside of the screen drum to prevent small solids from passing through the screen.
- Angled lifting vanes shall be positioned inside the drum screen to retain and lift solids into the screw trough.
- The screw trough shall extend beyond the drum screen opening at the influent end to maximize solids capture and reduce screenings recycle.
- The drive assembly for the screw shall be attached via a drive support flange welded to the upper end of the screenings transport tube.
- Screw drive unit with 2.0 HP TEFC motor suitable for 460/3/60 electrical supply.
- The shafted screenings screw conveyor to be constructed from high strength alloy steel with a two part epoxy coating.
- Compaction zone integral to the screw conveyor and with latched, hinged cover from type 304 stainless steel and safety interlock switch.
- Dewatering zone drain flush spray system from type 304 stainless steel with manual ball valve.
- Transport tube spray system from type 304 stainless steel and rubber hose with manual ball valves.
- The septage receiving unit shall be supplied with a two-stage tank. The inlet section of the tank shall slope toward the screen to prevent sedimentation. The second stage of the tank shall house the rotating drum screen.
- Tank flush wash system from type 304 stainless steel with manual ball valves.
- All covers will be gasketed and either hinged, bolted or latched.

GRIT TANK (EACH)

- Integral grit tank from type 304 stainless steel with effluent weir, flanged effluent connection and capped 3" drain. Removable bolted covers provide fully enclosed system and allow for operator access.
- Horizontal and inclined grit shaftless spiral screws from high strength alloy steel with protective primer coating.
- Grit tank aeration system with type 304 stainless steel/PVC/EPDM fine bubble diffusers and manual shutoff valve. Air to be supplied by others.
- Drive units with 0.75 HP horizontal grit conveyor motor, and 0.75 HP inclined grit conveyor motor suitable for 480/3/60 electrical supply.

FINE SCREEN SUPPORTS

- A stand from type 304 stainless steel is supplied to support the fine screen unit.

CONTROL PANEL AND INSTRUMENTATION (EACH)

- One (1) NEMA 4X stainless steel main control panel suitable for 480/3/60 electrical supply. Control panel shall contain the following devices for operation of the unit:
 1. Main disconnect with through door interlock handle.
 2. Step down control transformer.
 3. Branch circuit protection.
 4. Screen, horizontal and inclined grit drive motor starters.
 5. Emergency stop pushbutton.
 6. Screen, horizontal grit, inclined grit, compaction flush H-O-A switches.
 7. Load monitors for overload protection of screen and grit motors.
 8. Hour meter for each motor.
 9. Control power and run indicating lights.
 10. Alarm lights indicating overcurrent and starter overload.
 11. Alarm reset pushbutton.
 12. Programmable control relay for control logic functions.
 13. Run and alarm auxiliary contacts.
 - One (1) NEMA 4X local Emergency Stop pushbutton for field mounting at the unit.
 - Two (2) NEMA 4X safety microswitches mounted to the screen tank and screen dewatering/discharge access door.
 - Three (3) NEMA 4X brass body solenoid valves to control flow to the spray wash assemblies. Each valve shall be NEMA 4x 120 volt, single phase, 60 Hz.
- Level control: Provide conductivity rods controlled by an intrinsically safe relay.

SPARE PARTS (TOTAL)

- None.

FIELD SERVICE (TOTAL)

- Site service of one (1) trip of two (2) days for installation inspection, startup and operator training.

CLARIFICATIONS/COMMENTS

- None.

OPTIONAL ITEMS (EACH)

- Item B-1: Continuous Bagger Assemblies to collect dewatered screenings and grit at discharge points with refillable bag cassette.
- Item B-2: Grease Removal System –
 - Grit tank shall include grease capture zone with type 304 stainless steel baffles, drain box and 4" flanged discharge connection.
 - Grease removal system with scraper carriage. Carriage rides on stainless steel rails with UHMW guides and scraper, driven by a stainless steel cable system with a 1/3 HP motor suitable for 460/3/60 electrical supply.
 - Grease collection drain box with flanged discharged connection.

- Add necessary controls to control panel.
- Two (2) NEMA 4X limit switches mounted to the screen grease removal tank.
- Item B-3: Regenerative Blower with 1HP TEFC electric motor 480/3/60, inlet filter, silencer, PRV, check valve, pressure gauge, sound enclosure, and required controls added to control panel.

NOTE: ANY ITEM NOT LISTED ABOVE TO BE FURNISHED BY OTHERS.

EXCLUSIONS

Taxes, electrical wiring, conduit or electrical equipment, piping, valves, or fittings, shimming material, lubricating oil or grease, shop or field painting, field welding, erection, hoist or lifting apparatus, detail shop fabrication drawings, performance testing, unloading, storage, concrete work, civil design, grating, platforms, stairs, hand railing, dumpster (except as specifically noted).

This proposal section has been reviewed for accuracy and is approved for issue:

By: Chris Kincaid Date: March 1, 2016

BUDGETARY PRICING

Item	Equipment	Price in USD
A	One (1) SAVI Flo-Septage Receiving Station Model FSR-1200-DM.	\$170,000
A-1	Adder - Hauler Access Station, Base Station & Flo-Logic Hauler Management Software.	\$80,000
A-2	Adder – Outdoor Freeze Protection.	\$10,750
A-3	Adder – Continuous Bagger Assembly.	1,500
B	One (1) SPECO WasteMaster Combination Plant Model TSF2-M20 BEAST.	\$295,000
B-1	Adder – Continuous Bagger Assemblies.	\$4,500
B-2	Adder – Grease Removal System.	\$10,000
B-3	Adder – Regenerative Blower.	\$8,000

Validity:

Prices are valid for a period of 30 days from the date of this proposal. Beyond 30 days, delivery is subject to prior sales.

Warranty Statement and Term:

Enviro-Care Company, Inc. warrants the supplied equipment to the original end user against defects in workmanship or material under normal use and service in compliance with the original design specifications and the maintenance requirements and instructions as found in the Operations & Maintenance Manual. All Enviro-Care supplied equipment is warranted for twelve (12) months from date of start-up or eighteen (18) months from date of shipment, whichever occurs first.

Warranty Exclusions:

This warranty does not cover costs for standard and/or scheduled maintenance performed, nor does it cover consumables and Enviro-Care parts that, by virtue of their operation, require replacement through normal wear (aka: Wear Parts), unless a defect in material or workmanship can be determined by Enviro-Care. Wear parts are defined as brushes, rollers, spray nozzles, drum seals and other items specifically identified in the Operations & Maintenance Manual.

Warranty Coverage:

Enviro-Care's liability is limited to the supply or repair of defective parts returned, freight prepaid by buyer to a location specified by Enviro-Care. Repaired or replacement parts will be shipped to buyer prepaid via standard ground freight. Express or expedited shipments will be at the expense of the buyer.

Exclusions and Exceptions:

This Warranty excludes damage or wear to equipment caused by misapplication of product, improper maintenance, accident, abuse, unauthorized alteration or repair, Acts of God, or installation or operation that is non-compliant with Enviro-Care installation and operations instructions.

Limited Liability:

Enviro-Care shall not under any circumstances be liable for any incidental or consequential damages arising from loss, damage to property, personal injury or other damage or losses owing to the failure of Enviro-Care's equipment. The liability of Enviro-Care Company, Inc. is limited as set forth above within the time period set forth above.

Term: 15% with Submittal Approval
75% Net 30 Days after Shipment
5% - 120 Days after Shipment
5% after Startup and Training but not to exceed 180 Days.

Taxes: No sales or use taxes have been included in our pricing.

Freight: Prices quoted are F.O. B. shipping point with freight allowed to a readily accessible location nearest jobsite. Any claims for damage or loss in shipment to be initiated by purchaser.

Submittals: Full submittals will be supplied approximately **4 to 6 weeks** after receipt and acceptance of purchase order at the Enviro-Care offices.

Shipment: Shipment time is approximately **18 to 20 weeks** after receipt of approved submittal is received at the Enviro-Care offices. Under no circumstances will verbal approval be accepted.

Additional Field Service: This service may be scheduled at \$960.00 per day plus expenses or is available through a yearly service contract.



FLO-Beast SeptageStation DM

VFA-DM-T

For Heavy Solids Screening

The **BEAST**





FLO-Beast SeptageStation DM The BEAST

VFA-DM-T For Heavy Solids Screening

The Next Generation of Septage, FOG & Sludge Screening



Screening septage or heavy sludge comes with a long list of problems. The two most commonly identified are the inability to handle the heavy solids, and long truck unloading times. These are the result of not having the proper equipment for the application. The Beast has been engineered specifically for septage and heavy solids loading applications.

Unique Tank Design. Standard tank designs promote solids sedimentation. The Beast has a two-stage tank with a curved, sloped inlet section so septage is directed into the screen cylinder. The hopper trough extends beyond the cylinder opening which reduces screenings recycle. The drive configuration on the screen cylinder eliminates support arms and solves the ragging problem.

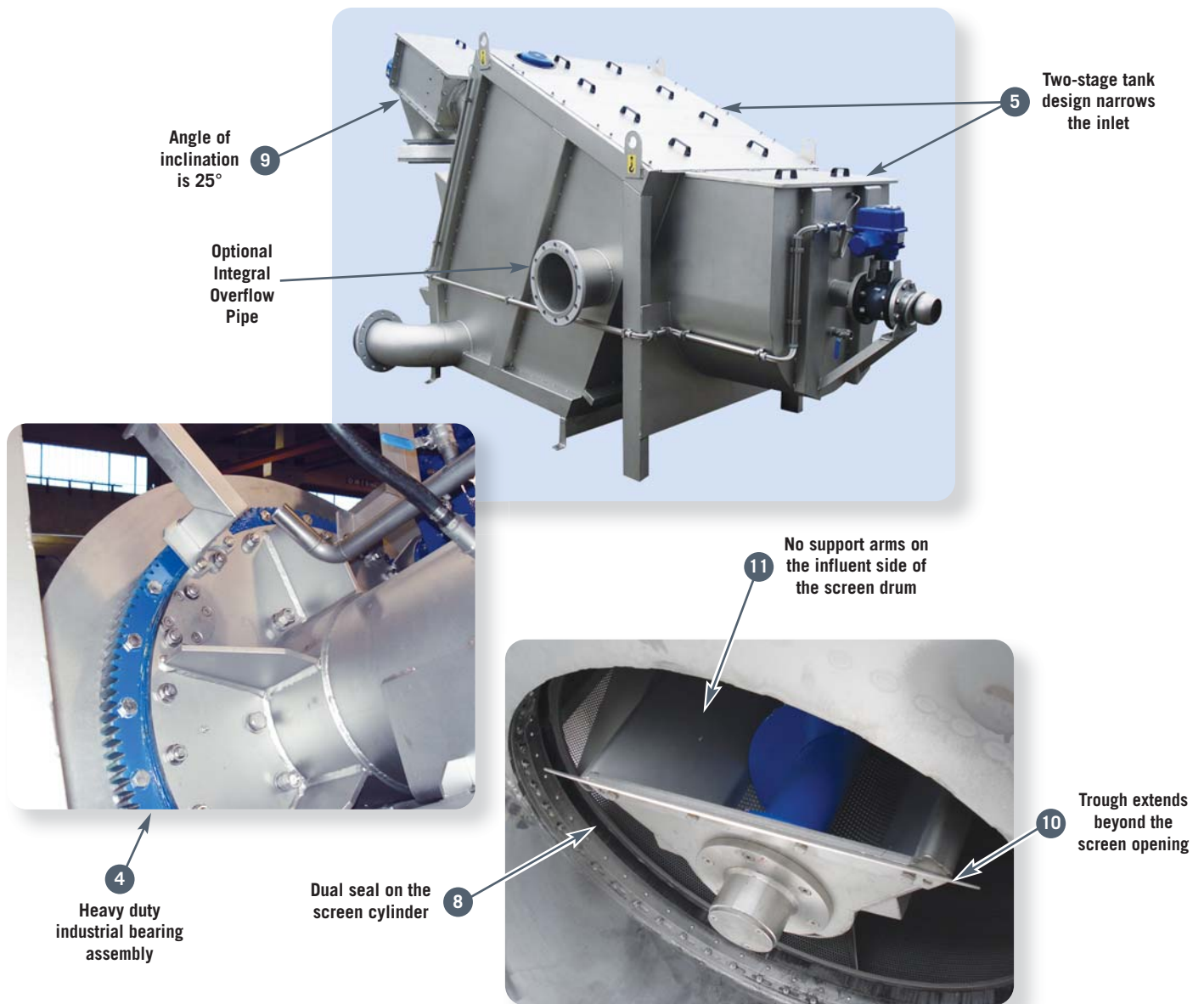
Dual Drive System. This feature enables the screen basket and auger to operate independently. The speed of the auger is increased to provide faster solids removal while the speed of the screen basket is decreased to improve screening efficiency.

Angle of Inclination. The drum screen component sits at a 25° angle inside the tank which promotes increased capture and transport of solids for faster unloading.

Sequence of Operation. As septage enters the tank, the short, narrow inlet directs the septage into the rotating screen drum. As the screen rotates, solids are captured on flights or scoops that carry the solids around the drum and deposit them into the auger trough.

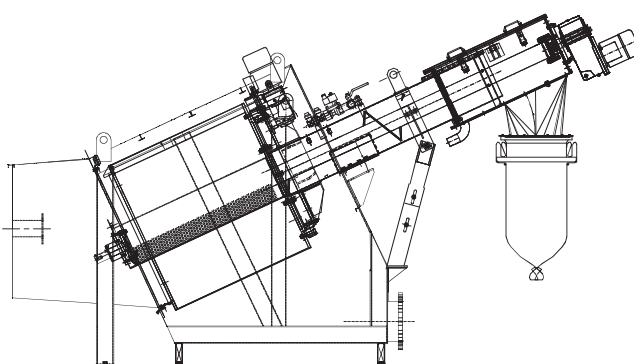
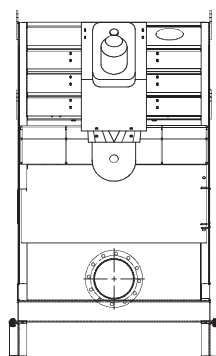


From the trough, solids are conveyed by the auger into the washing zone and then to dewatering. The percent of dryness achieved is dependent upon the solids concentration at the influent and the type of solids being dewatered.



Features & Benefits

- 1 **Engineered for large septage screening applications and high solids loadings** - Each feature solves a specific problem associated with these applications.
- 2 **Proven Flo-Drum technology** - Over 200 installations worldwide.
- 3 **Dual drive system** - Drum and auger are driven independently to optimize solids removal.
- 4 **Screen is mounted using a large diameter, single row, heavy duty industrial bearing assembly with a built in grease fitting** - Better resistance to axial and radial loading with fewer maintenance points.
- 5 **Two-stage tank design narrows the inlet** - Solids are fed directly into the screen basket which prevents sedimentation.
- 6 **The auger is run at a faster speed** - Removes material more quickly.
- 7 **The screen cylinder is run at a slower speed** - Produces better solids capture and cleaning of the screen.
- 8 **Dual seal on the screen cylinder** - Prevents bypass and improves capture rate to 65%.
- 9 **Angle of inclination is 25°** - Screen handles more solids and removes them faster.
- 10 **Trough extends beyond the screen opening** - Reduces screenings recycle by preventing solids from dropping out of the front of the screen basket.
- 11 **No support arms on the influent side of the screen drum** - Nothing to snag and accumulate long stringy solids.
- 12 **Eliminates brushes inside the screen basket** - Less extrusion and manipulation of the screenings for better capture and less maintenance.
- 13 **Additional monitoring options and security access may be added** - Controls can be as basic or as sophisticated as required.
- 14 **Optional bagger is available** - Maintains a cleaner screenings area.



Specifications

Drum Screen OD	mm	1000	1200	1400
Capacity (based on 3-4% solids content)	gpm	525	650	875
Screen media		Perforated plate		
Openings	mm	6		
Angle of inclination		25°		
Wash water pressure	bar	5 - 8		
Drive motor - Drum Screen	Kw	2	2	2
Drive motor - Shafted Screw	Kw	2	2	2
Controls		NEMA 4X/7		
Voltage	V-Hz	240/480 V - 60 Hz		

Materials of Construction

Screen media	AISI 304 SS (316 Optional)
Transport tube	AISI 304 SS (316 Optional)
Shafted screw	High Strength Alloy Steel (304/316 SS Optional)
Tank, piping, supports, end plates	AISI 304 SS (316 Optional)
Fasteners	AISI 304 SS (316 Optional)



1570 St. Paul Avenue • Gurnee, IL 60031 U.S.A.
P. 815.636.8306 • F: 847.672.7968

ecsales@Enviro-Care.com
www.Enviro-Care.com



FLO-Beast Liquid Waste Receiving System

VFA-DM-HS

With Hauler Station - Access Panel - Flo-Logic® Software

Fully integrated, secure, 24/7 operation and the next generation of septage screening.



A System Designed Specifically for Septage Pre-treatment

This system is made up of three different components. The Braun, the Integrator and the Brains.

The Flo-Beast SeptageStation DM is the Braun of this system. It screens the heavy solids from the septage and conveys, washes, and dewater those solids prior to discharge. The Beast does not require a rock trap or other high maintenance add-ons, such as grinders.

Both the screen and tank have been designed to eliminate the problems that plague other equipment currently available for septage applications. The result is fast truck unloading times and high capture efficiency.

Between the Beast and the Brains, is the Integrator hauler station. The hauler station controls and monitors the flow of septage between the truck and the screen.

The hauler access panel is connected to the hauler station and contains the Brains of the system - the Flo-Logic® software.



The Hauler Station

- Electrically actuated inlet valve
- Magnetic flow meter
- Hauler access panel
- Flo-Logic® software

The Brains - Flo-Logic® Software

Security

- Provides 24/7 access to permitted haulers.

Data Logging

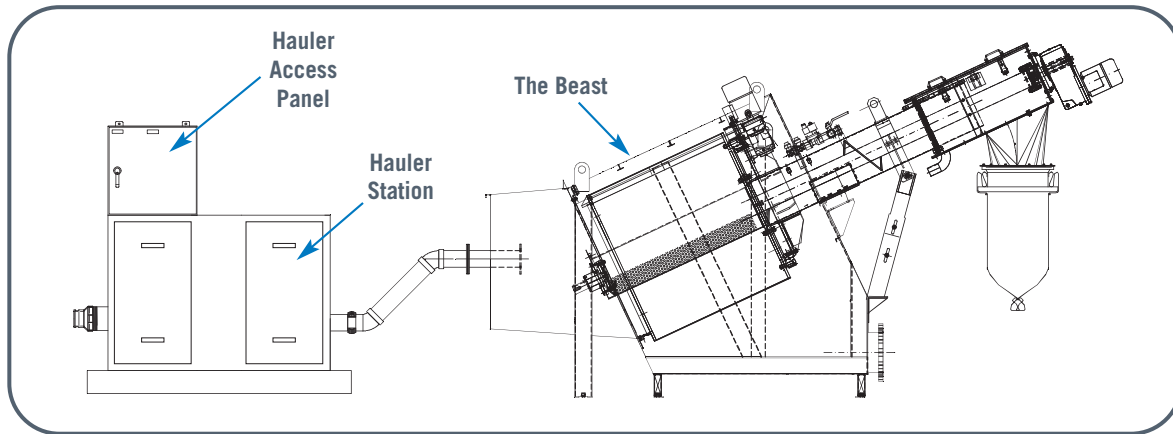
- Automatically collects data regarding trucks and septage loads.

Reporting

- Provides data sorting capabilities, report generating and billing information.
- Simple network connections.
- Can be WiFi enabled for data transfer to remote locations.

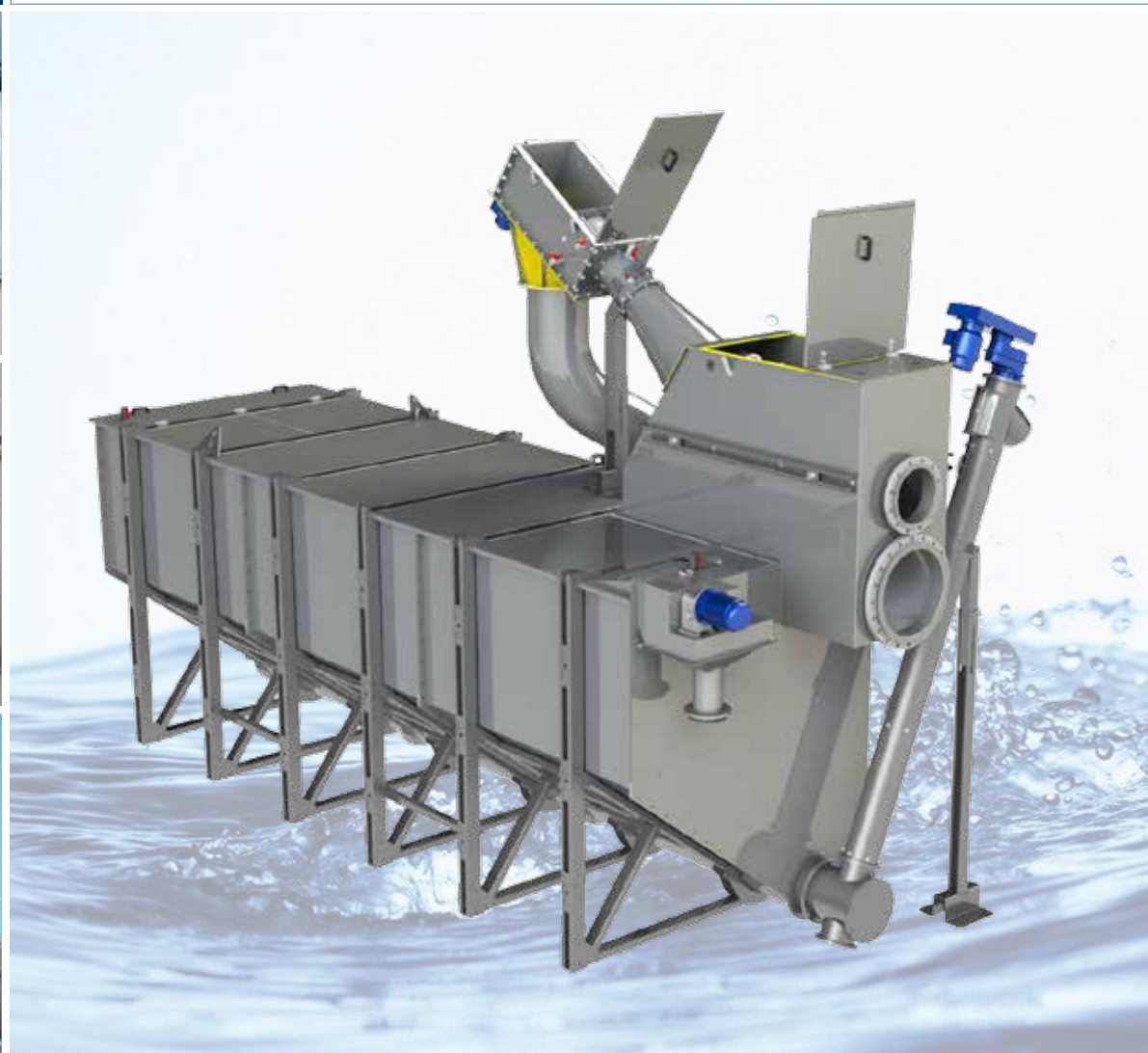


Key card activated.



Kershaw County South Carolina Septage Receiving Station.

Municipal and Industrial Waste Water
Mechanical Pre-treatment
WASTEMASTER® TSF 2-3



WASTEMASTER® TSF consists of a screw screen, a sedimentation tank, a sand extracting screw and a grease scraper.

	Solids Separation	Sedimentation	De-greasing
TSF 2	X	X	-
TSF 3	X	X	X

The first phase in the waste water treatment process is mechanical pre-treatment including:

- Solid-liquid separation, compaction and de-watering of solids larger in size than the screen slots;
- Sedimentation, lifting and de-watering of sand;
- Grease flotation and removal (TSF 3 only).

Subsequently the waste water is ready for further treatment (chemical, physical or biological), while solids are discharged for disposal.

Features

WASTEMASTER® TSF is designed for a wide range of waste water flow rates with different sedimentation capacities.

The possibility to choose the size of the screen perforation/slots, as well as cross section and length of the tank, is the assurance for the customer that he will obtain the right solution to his problem.

The machine comes in high-quality, industrially manufactured, standard modules, ready for comfortable on-site assembly if requested.

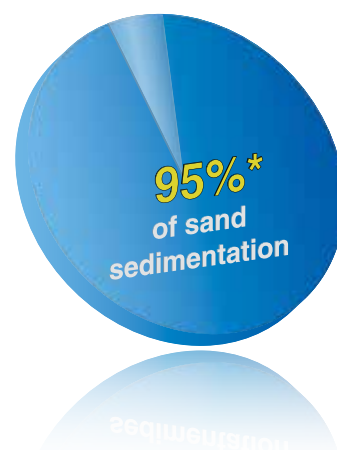
The screen section of the plant is equipped with a compacting device in the upper part for a volume reduction of the screenings of up to 35%. A washing system for the reduction of organic matter in the screenings is available on request.

The shaftless screen screw, which is manufactured in an innovative, patented process, ensures smooth operation without clogging even in presence of fibres.

The table below shows an example of how to choose the correct machine according to the requested sedimentation output rate.

TSF 2/3			FLOW RATE *	
Size	Module	Tank lenght (m)	Min (l/s)	Max (l/s)
S 1 0	1	2	5	13
S 2 0	2	4	12	30
M 1 0	2	4	25	39
M 2 0	3	6	35	60
M 3 0	4	8	60	85
L 1 0	4	8	80	115
L 2 0	5	10	110	145
L 3 0	6	12	140	175
L 4 0	7	14	170	205

* with a grain size of 0.2 mm and a Specific Gravity of 2.60-2.65 w/v

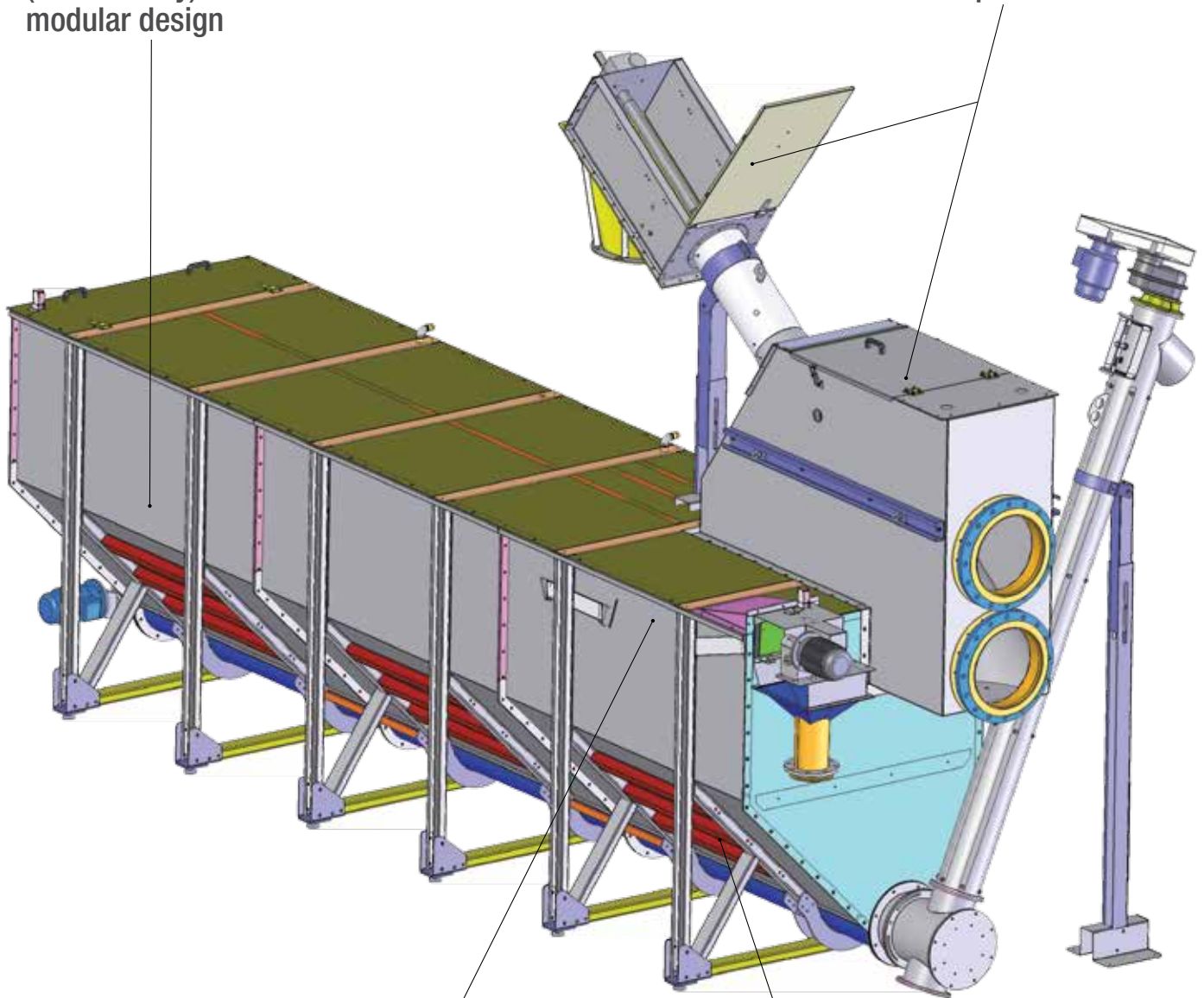




Easy on-site assembly
(if necessary) thanks to
modular design



Easy maintenance thanks
to wide inspection hatches



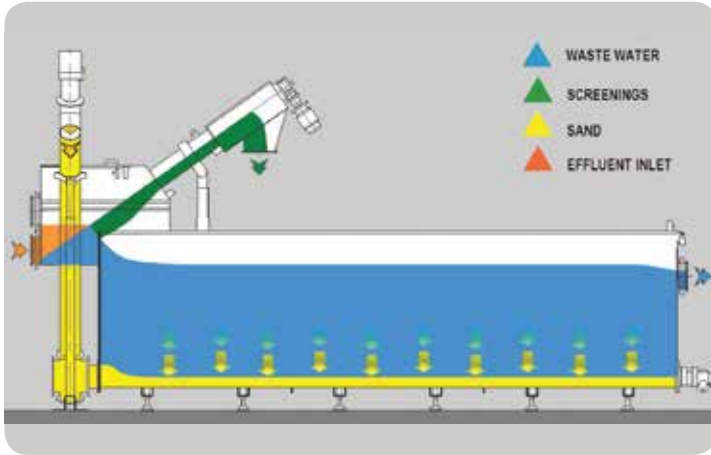
Self-adjusting grease scraper
with limited water removal



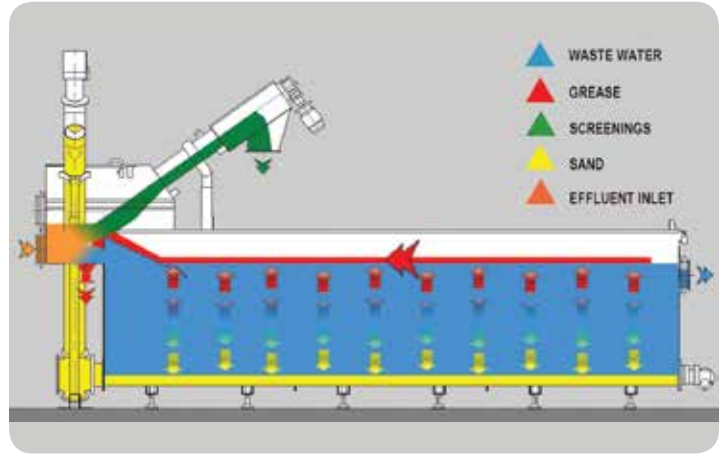
Bolted wear bars
(internal view of trough)

Process Description

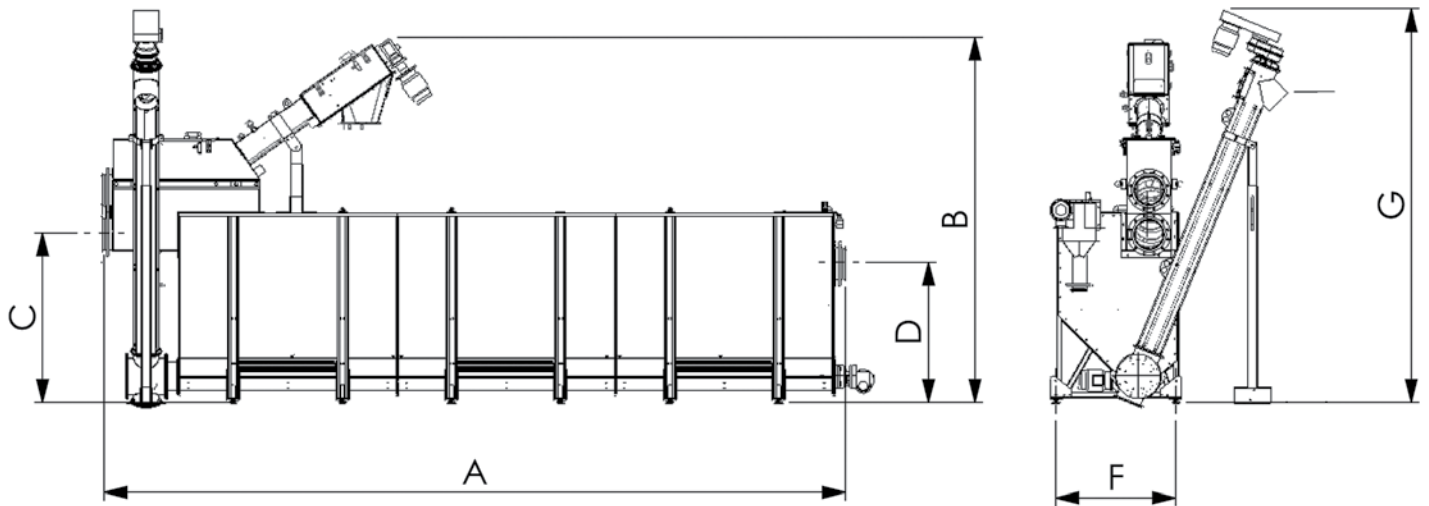
TSF 2



TSF 3



Overall Dimensions



Type	A	B	C	D	F	G
TSF S 10	2,850	3,350	1,550	1,280	1,100	3,610
TSF S 20	4,850	3,350	1,550	1,280	1,100	3,610
TSF M 10	4,830	4,000	1,780	1,460	1,420	3,900
TSF M 20	6,830	4,000	1,780	1,460	1,420	3,900
TSF M 30	8,830	4,000	1,780	1,460	1,420	3,900
TSF L 10	8,820	4,630	2,310	1,750	1,940	4,270
TSF L 20	10,820	4,630	2,310	1,750	1,940	4,270
TSF L 30	12,820	4,630	2,310	1,750	1,940	4,270
TSF L 40	12,820	4,630	2,310	1,750	1,940	4,270

Dimensions in mm

Application



1570 St. Paul Avenue
Gurnee, IL 60031 U.S.A.
P: 815.636.8306

ecsales@Enviro-Care.com
www.Enviro-Care.com



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UNI EN ISO 9001
Certified Company

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PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This specification includes the controls and software for a complete Waste Receiving Station that shall enable the facility to manage waste delivered by haulers from remote sites. This specification outlines the required control system and software that shall, at a minimum, identify permitted haulers and automatically transfer the transaction data to the administrator's office PC and other networked PCs.

1.2 QUALITY ASSURANCE

- A. The control system and software furnished under the section shall be provided by a manufacturer who has been regularly engaged in the design and manufacture of waste receiving systems for at least 10 years.
- B. The approved manufacturer of the control system and software shall be required to demonstrate a fully functional system that complies with this specification. The manufacturer shall provide a WEB presentation to show how the control system and software shall work.
- C. The control system shall be manufactured in accordance with all local and applicable standards and shall be inspected as an "Industrial Control Assembly" with either UL508A or CSA label identification.
- D. The manufacturer shall provide documentation necessary for the installation and operation of all associated components of the control system.
- E. The control system and software shall be furnished complete. All features outlined in this specification shall not impose any obligation to the SCADA supplier or the owner of the facility. Any control systems and software that reference these features as being provided by SCADA shall not be accepted on this project.

1.3 WARRANTY

- A. The manufacturer shall guarantee all components furnished as part of this specification for a period of one (1) year from date of shipment.
- B. The manufacturer shall provide software updates and phone support services for a period of one (1) year from date of shipment.

1.4 APPROVED MANUFACTURER

- A. The control system and software shall be the *Flo-Logic System* supplied by Enviro- Care of Rockford, IL.

1.5 TRAINING AND FIELD SERVICE

- A. The manufacturer shall provide a minimum of eight (8) hours of online orientation and WEB-based training for initial software installation and configuration.
- B. The manufacturer shall provide one service (1) trip if deemed necessary by the manufacturer. The trip shall include two (2) days of onsite service for administrative training, field configuration, and testing of the system.

1.6 USAGE AND LICENSING

- A. The manufacturer shall provide a multi-user software license to the facility. The license shall allow the software to be installed on multiple PCs at no additional cost.

PART 2 – CONTROL SYSTEM AND SOFTWARE

2.1 HAULER ACCESS STATION

- A. The manufacturer shall provide a secured Hauler Access Station that shall identify waste haulers and be configurable to interface with associated equipment such as doors, gates, valves, samplers, and screens & washers.
- B. Hauler access shall be established using a keypad, magnetic-stripe card, non- insertion proximity card, or long-range proximity card.
- C. The Hauler Access Station shall be constructed with an outer door that can be closed to enable a wash down of the area without damaging the internal mounted devices.
- D. The hauler can access the station by opening the door to the enclosure and entering a truck ID number using the keypad or by using an assigned card. The card type shall be magnetic-striped or non-insertion proximity card.
- E. If additional security measures are required by the facility, haulers shall use an additional card or pin number to access the front gate or door of the facility.
- F. The Hauler Access Station shall include a daylight visible display and outdoor-rated robust keypad with integral 2-track card reader. The display shall provide log-on instructions for the hauler and

prompt the hauler for additional information such as waste type.

- G. The Hauler Access Station shall include a receipt printer and integral light. The printer shall quickly print and cut each receipt and the integral light shall inform the hauler that a receipt has been printed.
- H. Each printed receipt shall include the following:
 - 1. Date and Time of Transaction
 - 2. Station ID and Ticket Number
 - 3. Hauler ID number
 - 4. Volume Unloaded
 - 5. Elapsed Time
 - 6. pH Reading (If configured)
 - 7. Alarm ID
 - 8. Waste Type
 - 9. Conductivity (If configured)
- I. The Hauler Access Station shall continue to function normally even without a network connection to the office. All hauler transaction data shall be stored in non-volatile memory. If a network connection is established, all transaction data shall be automatically synchronized and stored securely in an IT managed SQL database.
- J. The hauler access station shall be maintained without requiring Arc Flash protective clothing. All permitted personnel shall be able to access the Hauler Access Station without high risk. Activities such as changing the receipt paper shall be simple and possible by all permitted personnel. Motor Starters or other high voltage devices must be located in a separate control panel.
- K. Optional Waste Features:
 - 1. The Hauler Access Station shall divert the waste to a special holding tank
 - 2. The Hauler Access Station shall be configured to set operational parameters to process thicker waste in shorter time to decrease the hauler's unloading time.
- L. The Hauler Access Station shall include the following components:
 - 1. Enclosure
 - a. NEMA 4X Stainless Steel
 - b. Internal Swing-out Door (Stainless Steel)
 - c. Lockable Full-Grip Handle with 3-Point Latch
 - d. Drip Shield
 - e. Thermally Protected for Severe Cold Weather Installations
 - f. Instruction Decals
 - g. Optional Sun Shield and Pedestal

2. Access Keypad / Card Reader
 - a. Secure, Robust, and Outdoor Rated
 - b. Clear, Backlit LCD Display, Visible in All Levels of Light
 - c. Compliant with Local and Global Security Standards
 - d. Advanced Tamper-Proof Design
3. Programmable Logic Controller, PLC, Including:
 - a. Ethernet Connection to Flo-Logic Software
 - b. Configurable Spare Analog and Digital I/O
 - c. Printer Interface
 - d. Detachable Terminals
 - e. Non-Volatile Memory
4. Printer Terminal
 - a. Compact Thermal Printer
 - b. Exclusive Anti-Paper-Jam System (Self feeding, Self Correcting)
 - c. Integral Auto-cutter
 - d. Backlit Receipt Dispenser
 - e. Printed Receipt for Each Hauler
 - f. RS232 and USB Data Port
5. Pilot Devices
 - a. Heavy Duty, 30mm. AB Type 800H or Equal
 - b. 2-Position Switch with Done-Start Legend
 - c. Green Light with System Ready Legend
6. 24VDC Power Supply
7. Ethernet Switch (Non-Managed)

2.2 MANAGEMENT SOFTWARE

- A. The necessary management software shall be installed on one site owned PC. The PC must have a network card to communicate with Hauler Access Stations via Ethernet connection. The PC must have Windows XP Pro OS, Windows 7 OS, Windows 8 OS, or the appropriate server equivalent.
- B. The software shall interface with one or more Hauler Access Stations at one or more receiving sites using an Ethernet Connection.
- C. The software shall monitor the Hauler Access Station(s) and automatically upload hauler transaction data to the networked office PC.

D. The data from each hauler transaction shall be collected and stored in a secure SQL database. The following data shall be collected:

1. Site ID
2. Station ID
3. Ticket Number (On Hauler Receipt)
4. Hauler ID
5. Date and Time of Transaction
6. Volume Unloaded
7. pH (if configured)
8. Waste ID
9. Alarm ID
10. Sample Information (if configured)
11. Conductivity (if configured)

E. The software shall be used to configure the hauler's pin number, magnetic-striped card, and/or proximity card used at the Hauler Access Station(s).

F. The software shall be used to configure any devices that will measure the volume, pH or other user required parameters. The software may also be used to configure the frequency of automatic sampling.

G. A user-friendly interface shall be provided to allow the facility to view hauler transaction data and enter/edit information when necessary. The software shall provide multiple tabs to display all necessary information:

1. Station Connection Status
2. Volume Statistics
3. Activity Reports
4. Truck List
5. Alarms and Waste Types List
6. Station and Instrument Configuration
7. Station Schedule

H. The software shall allow the facility to define the Hauler Access Station's operating time schedule. If the station is closed, a message will alert the hauler that the station is closed.

I. The software shall allow the facility to periodically initiate a vacuum sampler. Samples can be taken automatically for each transaction or periodically for a specific truck. The software will collect data to show specifically which load was sampled.

J. Customer (Hauler) and Truck Features:

1. The software shall provide a table of 100 pre entered truck numbers for facility assignment to customers

2. Each customer shall receive a Hauler ID number and 4-digit PIN number for each truck. PIN number assignment can be unique per truck or common to multiple trucks, depending on the facility and customer preference. The software shall allow the administrator to manually assign pin numbers to customers.
3. The software shall allow the facility to enable or disable a truck's access privilege. Once disable, a hauler's access will immediately be denied at all sites. A message shall be displayed at log-in at the hauler station informing the hauler to contact the office.

K. Waste Type Features:

1. The software shall allow the facility to define a list of permitted waste types.
2. When accessing the station, the customer shall be prompted at log-in to identify the waste type that shall be unloaded.

L. Status and Alarm Features:

1. The software shall allow the facility to monitor the Hauler Access Station in real-time. The facility shall be able to monitor the current customers/trucks total flow, waste types, equipment faults, and additional information.
2. The software shall allow the facility to monitor alarms at the Hauler Access Station. Alarms make the station unusable or may prevent a hauler from unloading. These alarms include:
 - a. E-Stop pressed
 - b. Equipment Fault
 - c. Storage Tank at High Level
 - d. Optional User-Defined Alarms (ex. pH or Conductivity unacceptable)

M. Reporting Features:

1. The software shall have a pre-formatted reporting feature that will, at a minimum, show activity with daily totals and truck usage. The reports shall be easily exported into an Adobe PDF, Microsoft Excel spreadsheet, or Word document.

PART 3 – HAULER ACCESS STATION OPERATION

3.1 LOG-ON SEQUENCE

- A. The hauler shall turn the selector switch to the "START" position.
- B. The hauler will be prompted to enter swipe card or enter truck number.

- C. The hauler will be prompted to enter a PIN number followed by a waste type, if required by the site.
- D. The green "SYSTEM READY" pilot light will illuminate informing the hauler that access has been granted. The inlet valve will open.

3.2 LOG-OFF SEQUENCE

- A. The hauler shall turn the selector switch to the "DONE" position.
- B. The inlet valve shall then close and a receipt will be printed for the hauler.

3.3 ALARM SHUTDOWN

- A. The Log-off sequence will automatically be initiated if an alarm is triggered.
- B. An alarm ID shall be printed on the receipt and shall be recorded into the system.



Flo-Beast Septage Station DM
Model: FSR-1000-DM

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This section includes: one (1) fully automatic, self-cleaning, dual drive septage receiving unit and its associated motor controllers. Equipment shall be installed as shown on the plans, as specified herein, as recommended by the supplier and in compliance with all local, state and federal codes and regulations.

1.02 MANUFACTURER

- A. The equipment supplier shall be Enviro-Care Co., Inc., Gurnee, IL.
- B. The entire septage receiving unit shall be designed, coordinated and supplied by one manufacturer. The unit shall be supplied in one piece requiring no field assembly. The septage receiving system manufacturer shall take sole responsibility for the unit supplied.

1.03 REFERENCES

- A. Septage receiving units and motor controllers shall, as applicable, meet the requirements of the following industry standards:
- AISI (American Iron and Steel Institute)
 - ABMA (American Bearing Manufacturers Association)
 - AGMA (American Gear Manufacturers Association)
 - NEMA (National Electrical Manufacturer's Association)
 - NFPA (National Fire Protection Association)
 - ASTM (American Society for Testing and Materials)
 - WSC (American Welding Society Code)
 - ASME (American Society of Mechanical Engineers)
 - NEC (National Electrical Code)
 - UL (Underwriters Laboratory Standards)

1.04 EXPERIENCE

- A. One manufacturer will be responsible for the supply of the proprietary dual drive septage receiving system as specified herein. No deviations from this specification and system design shall be accepted.



1.05 SUBMITTALS

- A. The Manufacturer shall furnish the required number of submittals (and an electronic version if required) within forty-five (45) days of receipt of the order to verify compliance with the specification. The submittals shall include:
- B. Technical information:
 - 1. Shop drawings, manufacturer's installation drawing and wiring and schematic drawings.
 - 2. Motor performance data and features.
 - 3. Gear reducer data including service, efficiency, torque rating and materials of construction.
- C. Operation & Maintenance Manuals
 - 1. Equipment Operating instructions
 - 2. Equipment weights and lifting instructions.
 - 3. Installation instructions
 - 4. Maintenance schedules
 - 5. Recommended lubricants
 - 6. Recommended spare parts including wear items.
 - 7. Long-term and short-term storage instructions.
- D. Equipment information:
 - 1. Brochures and other descriptive literature.
 - 2. Installation reference list.
 - 3. Manufacturer's Warranty

1.06 WARRANTY

- A. All Enviro-Care equipment is covered against manufacturing defects in materials and workmanship during normal use and service for a period of one (1) year from date of start up as long as periodic maintenance procedures are followed and performed. Items specifically not covered by the one year warranty are consumable wear parts as identified in the O&M manual.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Flo-SeptageStation DM Model FSR-1000-DM shall be as supplied by Enviro-Care, Inc., of Gurnee, Illinois, U.S.A.
- B. No alternative manufacturers shall be accepted.

2.02 QUALITY ASSURANCE

- A. The septage receiving unit will be fully assembled and shop tested to confirm fit and function of the unit. A certificate of the shop test shall be supplied with the shipping documents.
- B. The septage receiving unit will be shipped to the site fully assembled, some ancillary components may be removed in order to prevent damage during shipment.

2.03 PERFORMANCE REQUIREMENTS

Conditions	Unit
Number of units	1
Influent Type	Septage
Influent Solids Concentration (% solids)	4%
Peak flow per screen (gpm)	525
Perforation Size (mm)	6
Screenings discharge height from operating level	59"
Screen Installation Angle	25°

2.04 UTILITY REQUIREMENTS/ENVIRONMENTAL CONDITIONS

Conditions	Unit
Spray Wash Water (gpm/psi)	30/60
Power Supply (V/P/Hz)	460/3/60
Screen Installation Location (indoor/outdoor)	
NFPA Classification Requirement	
Control Panel Location (indoor/outdoor)	
NFPA Classification Requirement	

2.05 DESIGN REQUIREMENTS

- A. General
 - 1. Equipment provided shall be a fully automatic, self-cleaning, septage receiving unit incorporating a perforated plate rotating drum screen and an integral screenings washing, conveying and dewatering/compacting system contained within a stainless steel tank. The tank mounted rotating drum screen unit will be provided with an angle-of-inclination of 25° from horizontal.



2. Each rotating drum screen unit shall be provided with a rotating screen basket, exterior basket cleaning spray bar(s), exterior basket cleaning brush, concentric transport screw with integral screenings washing, dewatering and screenings compaction zone.

B. Rotating Drum Screen Basket

1. The Drum Screen Basket shall be designed and built to withstand the maximum possible static hydraulic forces exerted on the screen by the liquid flow. Structural and functional parts shall be sized to prevent deflections or vibrations that may impair the screening, conveying, washing and compacting operations.
2. The drum screen basket shall be mounted at the drive end using a large diameter, single row, heavy duty industrial bearing assembly with integral ring gear comprising part of the drive system. The bearing assembly shall have a built in grease fitting.
3. The drum screen basket shall be of a cylindrical shape with perforations around the entire basket.
4. The drum screen basket shall be perforated plate with maximum openings of 6 mm. Bar screens, wire mesh or wedge wire will not be acceptable screen media.
5. The drum screen basket shall have angled lifting vanes to retain loose solids during rotation and lift them up and into the screw auger trough. Helical shaped vanes which can tumble screenings rather than lift screenings shall not be accepted.
6. The screenings collection trough shall extend beyond the screen opening at the influent end to maximize solids capture and reduce screenings recycle.
7. The drum screen shall have no support arms on the influent side of the screen basket to snag and accumulate long stringy solids. Screens with influent side support arms will not be accepted.
8. The drum screen basket shall be provided with a double face seal system, incorporating UHMW-PE inner seal and a rubber seal pressing on the external part of the drum ring preventing laminar bypass. Any unit which does not incorporate this design will not be accepted.

C. Drum Screen Basket Cleaning Brush and Spray Bar(s)

1. The exterior of the rotating drum screen basket assembly shall be cleaned by a high pressure stainless steel spray bar and a stainless steel backed polypropylene brush. The drum screen basket shall continuously rotate in one direction during the cleaning cycle and pass through the topmost portion where it is cleaned by the spray bar and brush.
2. The exterior cleaning brush shall be mounted on a holding device which keeps the brush in constant contact with the screen basket and can be adjusted to compensate for brush wear.

D. Screenings Transport Screw and Dewatering Zone

1. The screenings transport screw shall be constructed of an epoxy coated high strength alloy steel for maximum torsion resistance in the screw. The screw shall be near-white blasted, primed with an inorganic zinc primer and coated with a 2 part epoxy.
2. The screenings collection trough shall be attached to the screenings transport tube by a basket support flange. The screw drive assembly shall be attached via a drive support flange welded to the upper end of the screenings transport tube.
3. The concentric transport/dewatering screw shall be designed to transport and dewater the screened material. The unit shall be provided with screw flights of constant pitch approaching the compaction zone in order to prevent clogging in the compaction zone. Designs incorporating a decreasing pitch screw will not be accepted.
4. The screenings transport screw shall be supported by a sealed, self lubricating lower bronze bushing. The lower bushing shall be designed such that it does not take any thrust load from the transport screw. Designs requiring bearings of any type or externally lubricated bushing(s) or water injection into the housing shall not be accepted.
5. The compaction zone shall be integral to the transport screw and compaction tube. The compaction zone shall be designed to form a screenings plug and return water released from the screened material back to the tank through circular holes that are machined into the screenings compaction tube.
6. The compaction zone housing shall be fabricated entirely of stainless steel. The lower body shall be a welded construction with a minimum of 10mm end plates for maximum torsion resistance. The bottom of the compaction zone shall be curved to promote maximum cleaning and minimum depositing of materials. Units utilizing a fiberglass reinforced compaction zone housing will not be accepted.



7. The compaction zone shall be furnished with a latched, hinged access cover with a gasket. The access cover shall incorporate a safety interlock switch in order to prevent operation of the unit with the access cover open. Units which require the use of any tools to gain access to the compaction zone will not be accepted.

E. Spray Wash Systems

1. Each spray system shall be furnished with a control solenoid valve, stainless steel piping and fittings, flexible reinforced hoses and spray nozzles.
2. Automatic spray wash systems for the screen shall be constructed of stainless steel piping and flexible reinforced hose. Spray wash system shall operate only when the screen basket is rotating.
3. A drum wash system shall be located over the rotating basket/drum which utilizes a spray bar(s) with adequate spray nozzles to ensure a consistent spray pattern over the entire length of the basket.
4. A screenings spray wash system shall be located in the lower section of the transport tube to break up and return organic materials to the flow stream and to ensure maximum screenings washing.
5. A compaction zone wash system shall be provided which periodically cleans the compaction and dewatering zone via a stainless steel wash header located in the uppermost end of the compaction/dewatering chamber. The header shall be designed to completely wash the full surface of the transport tube drainage area.

F. Tank

1. The septage receiving unit shall be supplied with a two stage stainless steel tank. The bottom of the influent section of the tank shall be sloped toward the screen to eliminate sedimentation. The inlet section shall be sized to match the inlet shape of the drum to prevent a wall for solids to dam and collect. Units with rectangular tanks which encourage sedimentation shall not be accepted.
2. The second stage tank shall house the rotating drum screen unit.
3. The inlet stage of the tank shall be provided with a flush wash system.

G. Drive Units

1. The septage receiving unit shall be a dual drive system which allows the drum and screw to be driven independently to optimize solids removal.



2. Gear reducers shall be a helical gear type as manufactured by NORD or approved equal. Provide a cast iron frame; design in accordance with AGMA recommendations for wastewater service.
3. Transport screw shall be directly driven by a flange mounted gear reducer.
4. The transport screw gear reducer shall be bolted to a machined flange welded to the upper end of the transport tube.
5. The rotating screen drum basket shall be driven by a flange mounted gear reducer using a spur gear and bull gear assembly.
6. Gear reducers shall be driven by 240/480v, 3ph, 60hz motors rated for the installation environment location. Motor horsepower shall be determined by the screen's basket diameter.
7. Chain drives, belt drives, friction drives, or hydraulic drives will not be accepted.
8. Designs incorporating a separate upper bearing for the transport screw will not be accepted.

2.06 ELECTRICAL CONTROLS AND DEVICES – Drum Screen and Screw Control Panel

A. Panel shall include the following components:

1. (1) Enclosure, NEMA 4X, 304 Stainless Steel.
2. (1) Disconnect, with Door Interlocked Handle.
3. (2) Reversing motor starters with overload protection (480VAC Max, 2HP, Drum and Screw motor). (soft start on drum and reversing motor start on auger – with Load or Power Monitor if auto reversing/jam protection used)
4. (1) Control Power Transformer, 480-120VAC w/branch circuit protection.
5. (1) Surge Protection Device, 120VAC.
6. (1) Programmable Logic Controller, Allen-Bradley MicroLogix, with Ethernet and Required IO.
7. (1) Operator Interface Unit, Allen Bradley Panelview C400.
8. Panel Heater, with Thermostat [as required]
9. Pilot Lights, Transformer type (Motor Run & Fault, Control Power, High Water level).

10. Push buttons (E-Stop, System Reset).
 11. Selector Switches (Motor HOA, Wash Solenoids HOA).
 12. (1) Barrier relay (inspection door safety switch).
 13. UL508A.
- B. Safety Microswitch: safety interlock switch shall be factory mounted to the compaction/discharge zone access door. Interlock switch shall prevent operation of the screen while the doors is open.
- C. Solenoid Valves: Provide two (2) solenoid valves to control flow to the spray wash assemblies. Each valve shall have a brass body. Each valve shall be 120 volt, single phase, 60 Hz.
- D. Level Control: Provide capacitance rods controlled by an intrinsically safe capacitance relay.

2.07 OPERATION, MONITORING, AND CONTROL – Screen, Conveying, Dewatering Unit

- A. Drum Screen Hand Operation: Screen to run continuously.
- B. Drum Screen Automatic Operation: Screen to operate based on the level sensor. Provide provisions to prevent excessive starting and stopping of the unit.
- C. Drum Screen Basket Spray Wash/Screening Wash System Hand Operation: Spray wash shall run continuously.
- E. Drum Screen Basket Spray Wash/Screening Wash System Automatic Operation: Spray wash shall run when the drum assembly is rotating in forward operation.
- D. Transport Screw Hand Operation: Screw to run continuously.
- E. Transport Screw Automatic Operation: Screw to operate based on the level sensor. Provide provisions to prevent excessive starting and stopping of the unit.
- F. Compaction Zone Spray Wash Hand Operation: Spray wash shall run continuously.
- G. Compaction Zone Spray Wash Automatic Operation: Spray wash shall cycle on and off based on the spray wash cycle timer.



H. Fault Conditions:

1. In the event of momentary motor over current the controls shall attempt to clear the jam by reversing the direction of rotation of the transport screw. If the jam cannot be cleared, the controls shall stop the drive motor, and illuminate the alarm indicating light. Reset shall be manual on the outside of the control panel.
2. In the event of high water level, the Hauler Access Station shall close the inlet valve and illuminate the indicating light and alarm.

PART 3 - EXECUTION

3.01 PREPARATION

- A. An adequate concrete equipment pad shall be provided for installation of the Flo-SeptageStation DM and Hauler Access Station Base. The equipment pad shall be flat and level.

3.02 LIFTING AND MOVING EQUIPMENT

- A. Lifting points shall be identified on all Enviro-Care equipment. A crane of sufficient capacity must be on site for unloading the equipment from the truck and placing in the channel for installation.

3.03 INSTALLATION

- A. The installation is the responsibility of the Purchaser. Complete installation procedures are included in the O&M manual shipped with the unit.

3.04 START UP/TRAINING/FIELD QUALITY CONTROL

- A. The initial start-up of Enviro-Care equipment will be performed by Enviro-Care personnel and/or an authorized Enviro-Care representative(s). The Enviro-Care authorized representative(s) will verify the proper operation and installation, and provide training to the equipment operators. Two (2) days are allotted.

3.05 ADJUSTING AND CLEANING

- A. Information on minor periodic adjustments and cleaning is contained in the Operating and Maintenance Manual.



PART 4 – OPTIONS

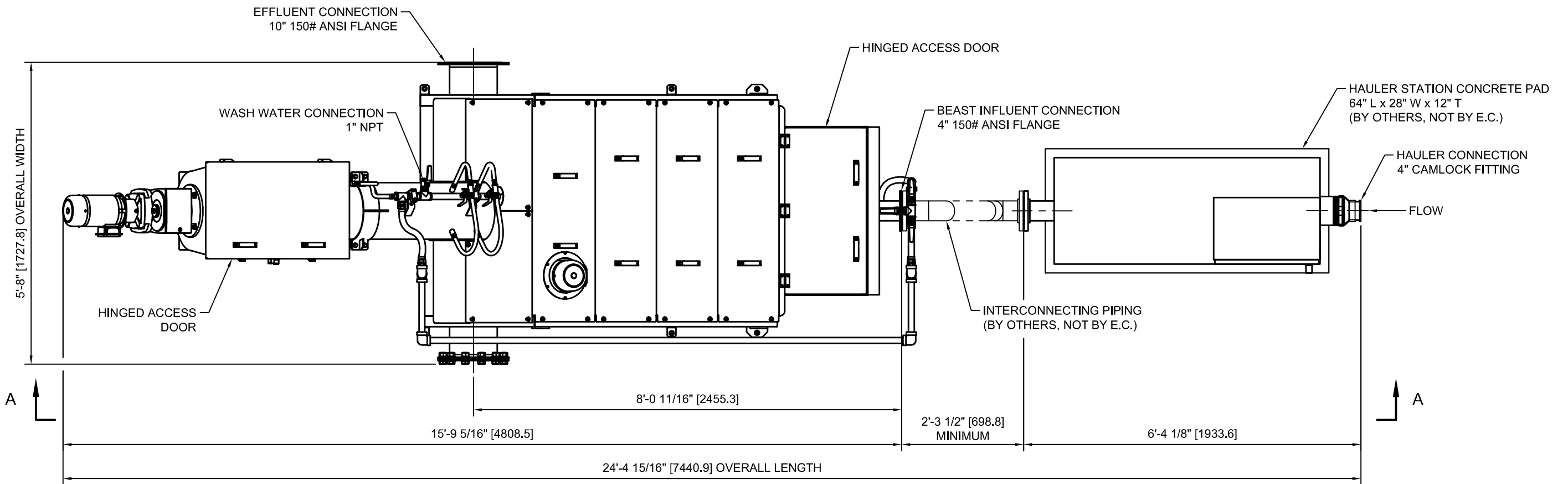
4.01 BAGGER SYSTEM

- A. A continuous screenings bagger system with refillable bagger cassette shall be provided for containment, odor control, and sanitary handling of screenings.
- B. Bagger system consists of a stainless steel and ABS plastic cassette holder with continuous polyethylene bag cassette.

4.02 RECOMMENDED SPARE PARTS

- A. Spray nozzles
- B. Solenoid valve rebuild kit
- C. Spare bagger cassette containing 210 feet of bag material

4.03 YEARLY SERVICE CONTRACT (CONSULT MANUFACTURER FOR DETAILS)





PLAN

PROCESS DESIGN INFORMATION:

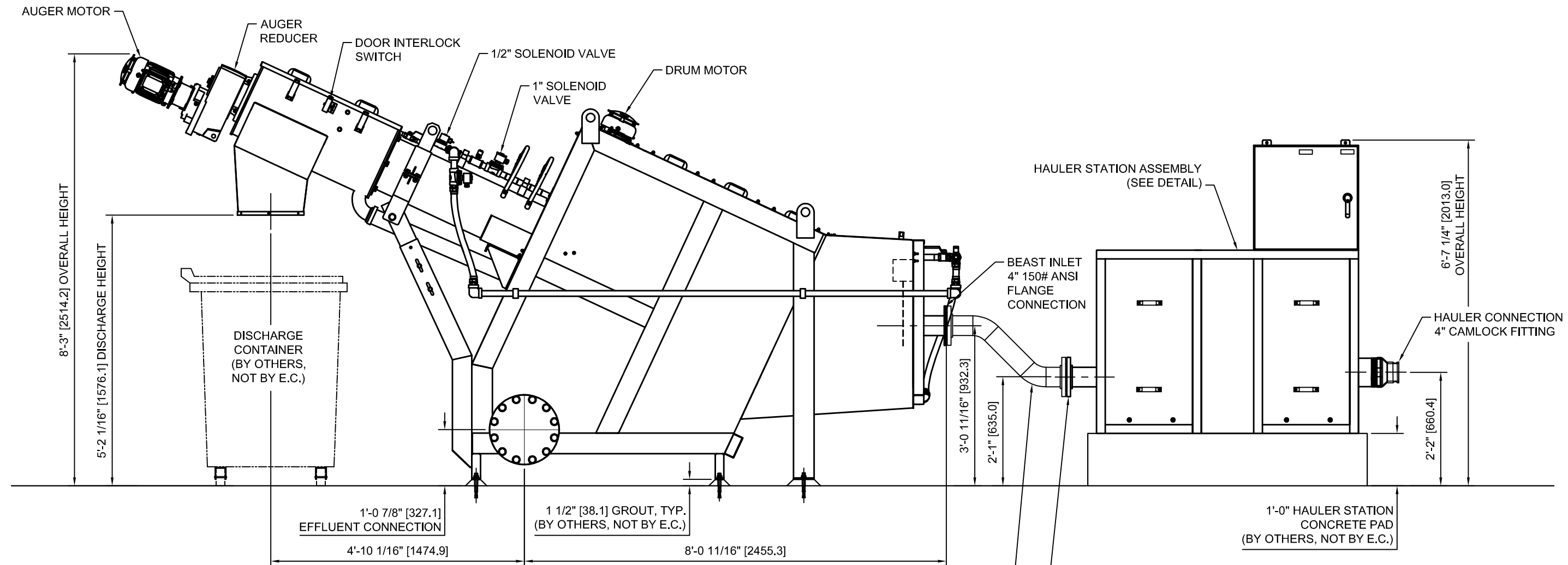
APPLICATION: SEPTAGE SCREENING
PEAK DESIGN FLOW: 650 GPM
SCREEN INCLINE: 25 DEGREES FROM HORIZONTAL
PERFORATION SIZE: 6 MM

NOTES:

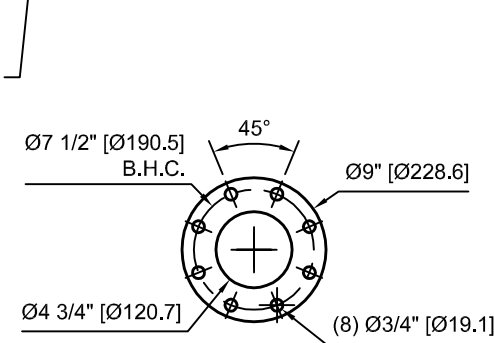
- MOTORS:
DRUM: 2 HP, 230/460 VOLT, 3 PHASE, 60 HZ
AUGER: 2 HP, 230/460 VOLT, 3 PHASE, 60 HZ
- APPROXIMATE WEIGHTS:
SCREEN - 3,500 LBS (1,580 KG)
HAULER STATION - 1,200 LBS (545 KG)
- WATER REQUIREMENTS: 40 GPM @ 70-120 PSI (2.5 L/S @ 5-8 BAR)
- ALL INTERCONNECTING PIPING AND WIRING BY OTHERS, NOT BY ENVIRO-CARE.
- ALL DIMENSIONS ARE IN INCHES [MM].

 A WAMGROUP Company		 THIRD ANGLE PROJECTION	
PROPERTY OF ENVIRO-CARE COMPANY. ALL RIGHTS RESERVED. NO PART OF THIS DRAWING MAY BE REPRODUCED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM ENVIRO-CARE. ENVIRO-CARE COMPANY RESERVES THE RIGHT TO ALTER DATA OR THE DESIGN OF ITS EQUIPMENT AT ANY TIME WITHOUT PRIOR NOTICE AND WITHOUT ANY OBLIGATION WHATSOEVER.			
TITLE SALES DRAWING FLO-SEPTAGE STATION DM FSR-1200 DM			
DRAWING BY CK09	CHECKED BY	B SIZE SCALE 1/2" = 1'-0"	DATE 2015-08-04
PROJECT NUMBER		DRAWING NUMBER	SHEET REV 1 OF 2 0

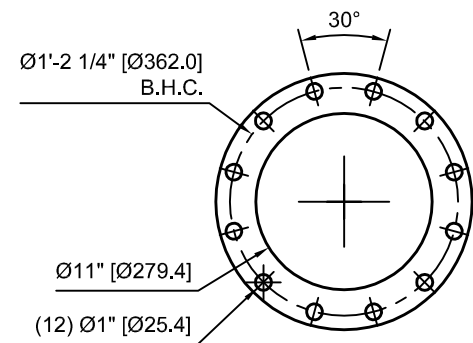
REV	REVISION DESCRIPTION	REVISION BY	APPROVED BY	DATE



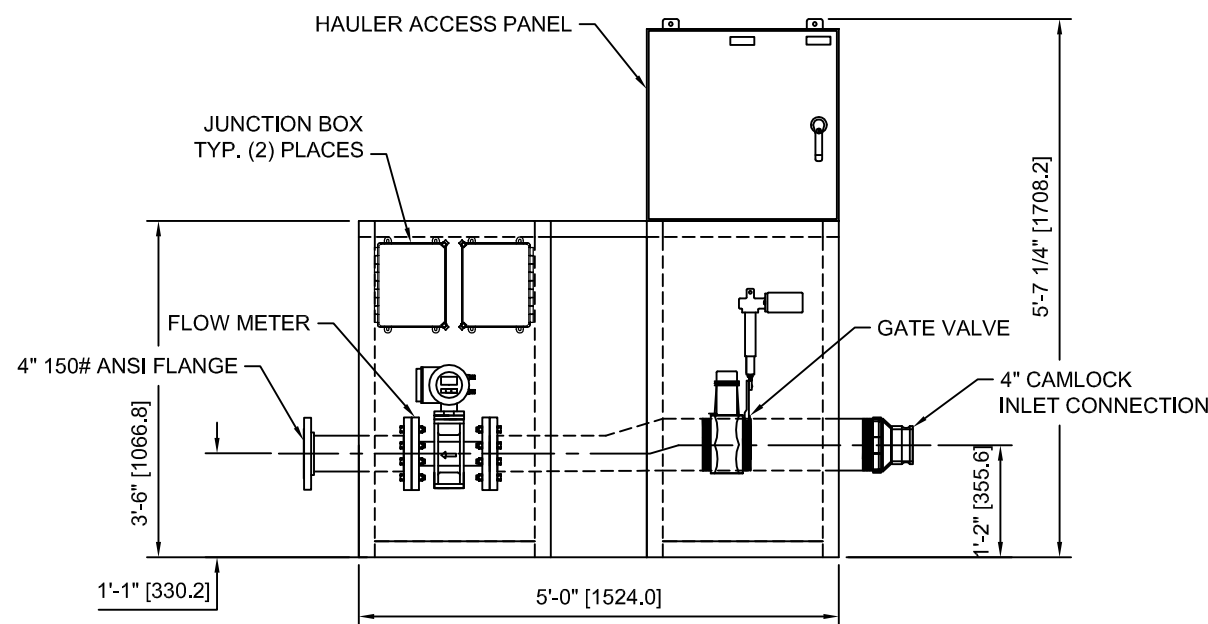
SECTION A - A



INFLUENT FLANGE DETAIL
SCALE: 1" = 1'-0"





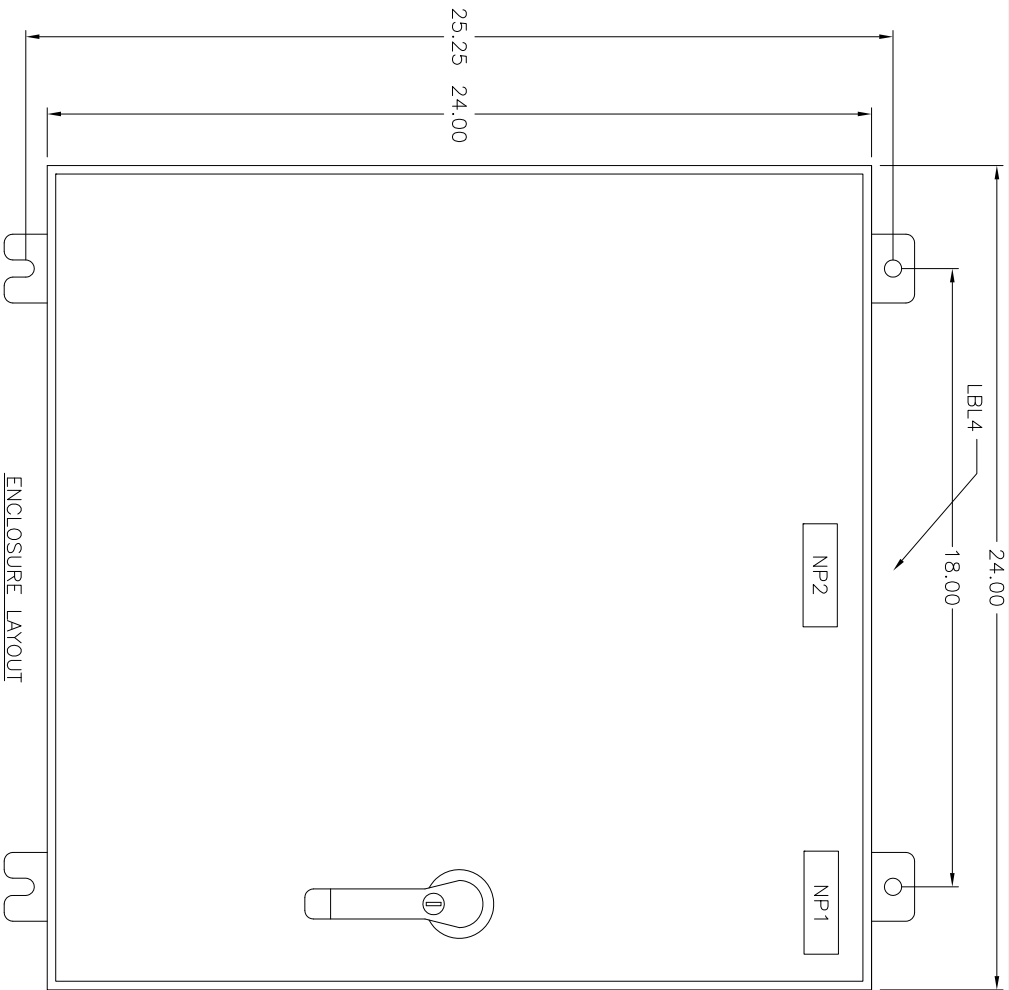
EFFLUENT FLANGE DETAIL
SCALE: 1" = 1'-0"



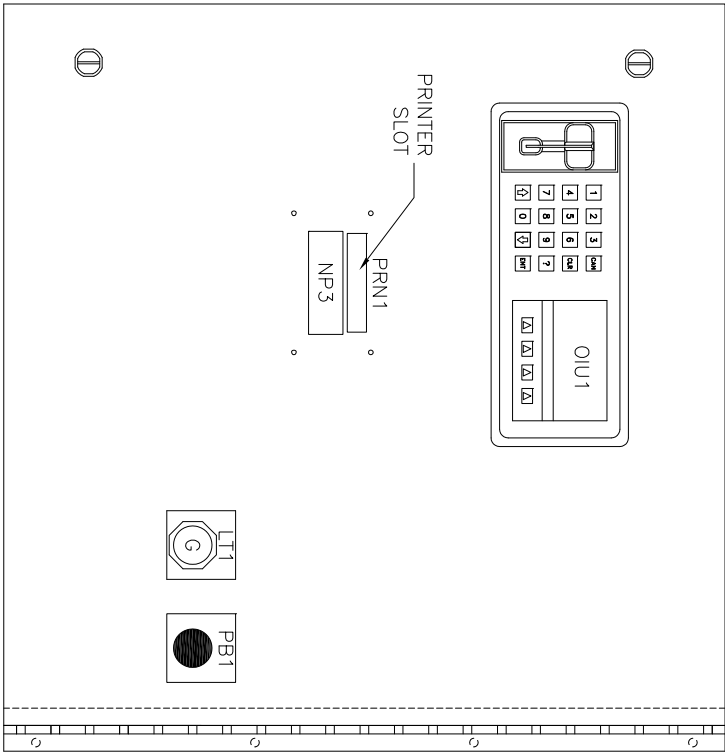
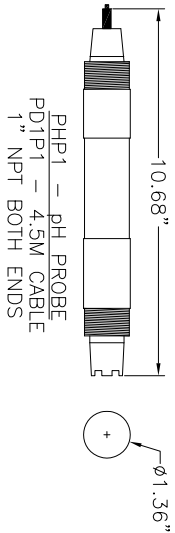
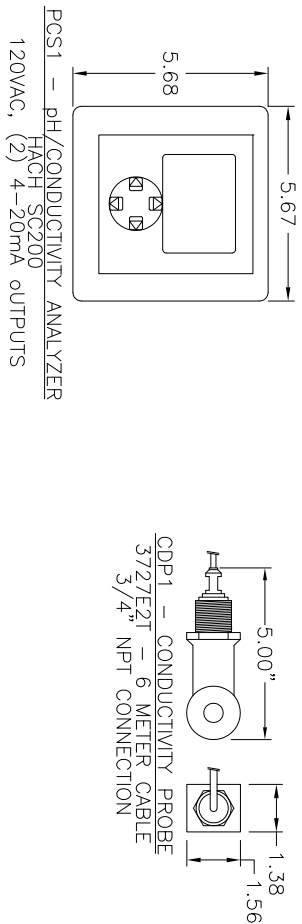
HAULER STATION DETAIL

REV	REVISION DESCRIPTION	REVISION BY	APPROVED BY	DATE

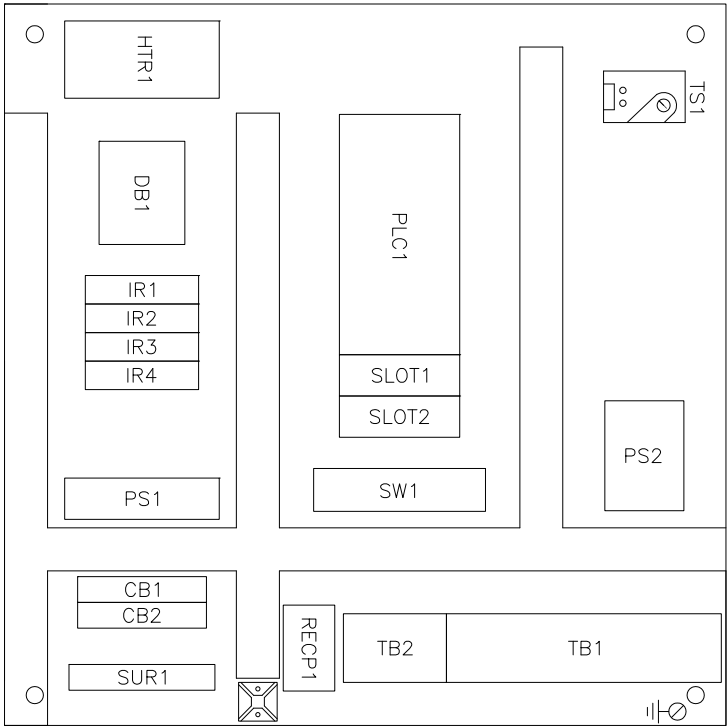
 Enviro-Care A WAMGROUP® Company		 THIRD ANGLE PROJECTION	
PROPERTY OF ENVIRO-CARE COMPANY. ALL RIGHTS RESERVED. NO PART OF THIS DRAWING MAY BE REPRODUCED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM ENVIRO-CARE. ENVIRO-CARE COMPANY RESERVES THE RIGHT TO ALTER DATA OR THE DESIGN OF ITS EQUIPMENT AT ANY TIME WITHOUT PRIOR NOTICE AND WITHOUT ANY OBLIGATION WHATSOEVER.			
TITLE SALES DRAWING FLO-SEPTAGE STATION DM FSR-1200 DM			
DRAWING BY	CHECKED BY	B SIZE SCALE	DATE
CK09		1/2" = 1'-0"	2015-08-04
PROJECT NUMBER	DRAWING NUMBER	SHEET	REV
		2 OF 2	0



ENCLOSURE LAYOUT
24"Hx24"Wx14"D
NEMA 4X 304 STAINLESS STEEL
HAULER STATION
WITH 3-POINT LATCHING HANDLE AND
DRIP SHIELD OVER OUTER DOOR



INNER DOOR LAYOUT
21"Hx21"W

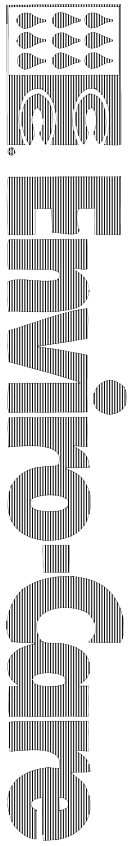


SUB-PANEL LAYOUT
21"Hx21"W

LEGEND/PLATES:
LT1 - SYSTEM READY
PB1 - HAUL COMPLETE

NAMEPLATES:
NP1 - 120VAC - 1PH - 60HZ
NP2 - HAULER STATION
NP3 - RECEIPT - DO NOT TUG ON PAPER

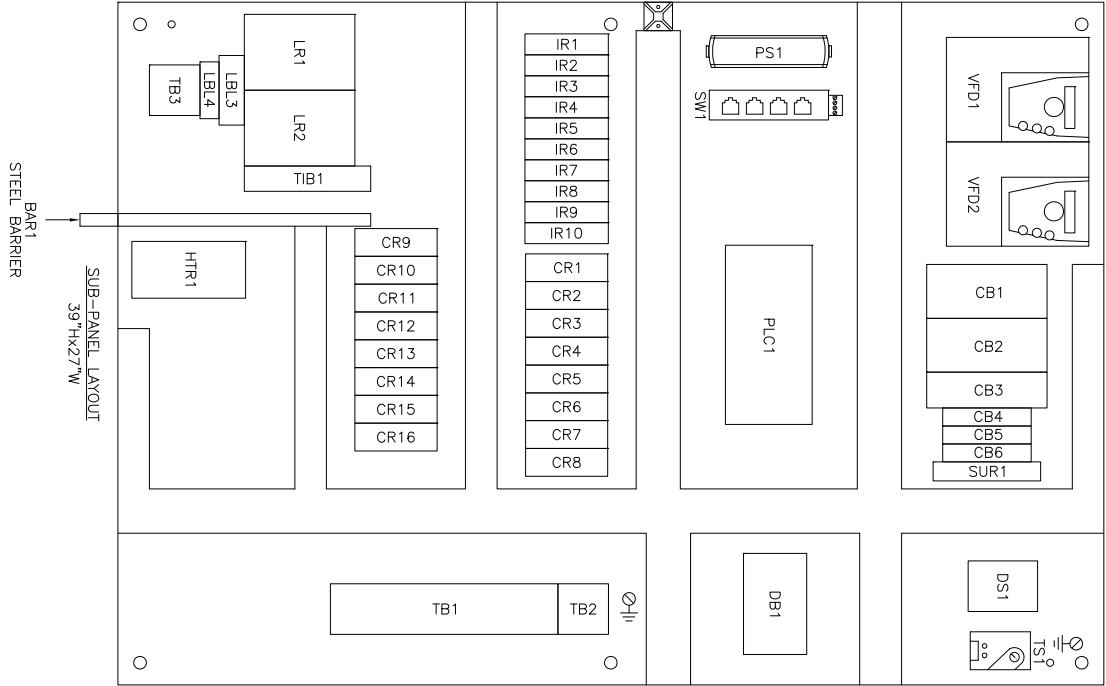
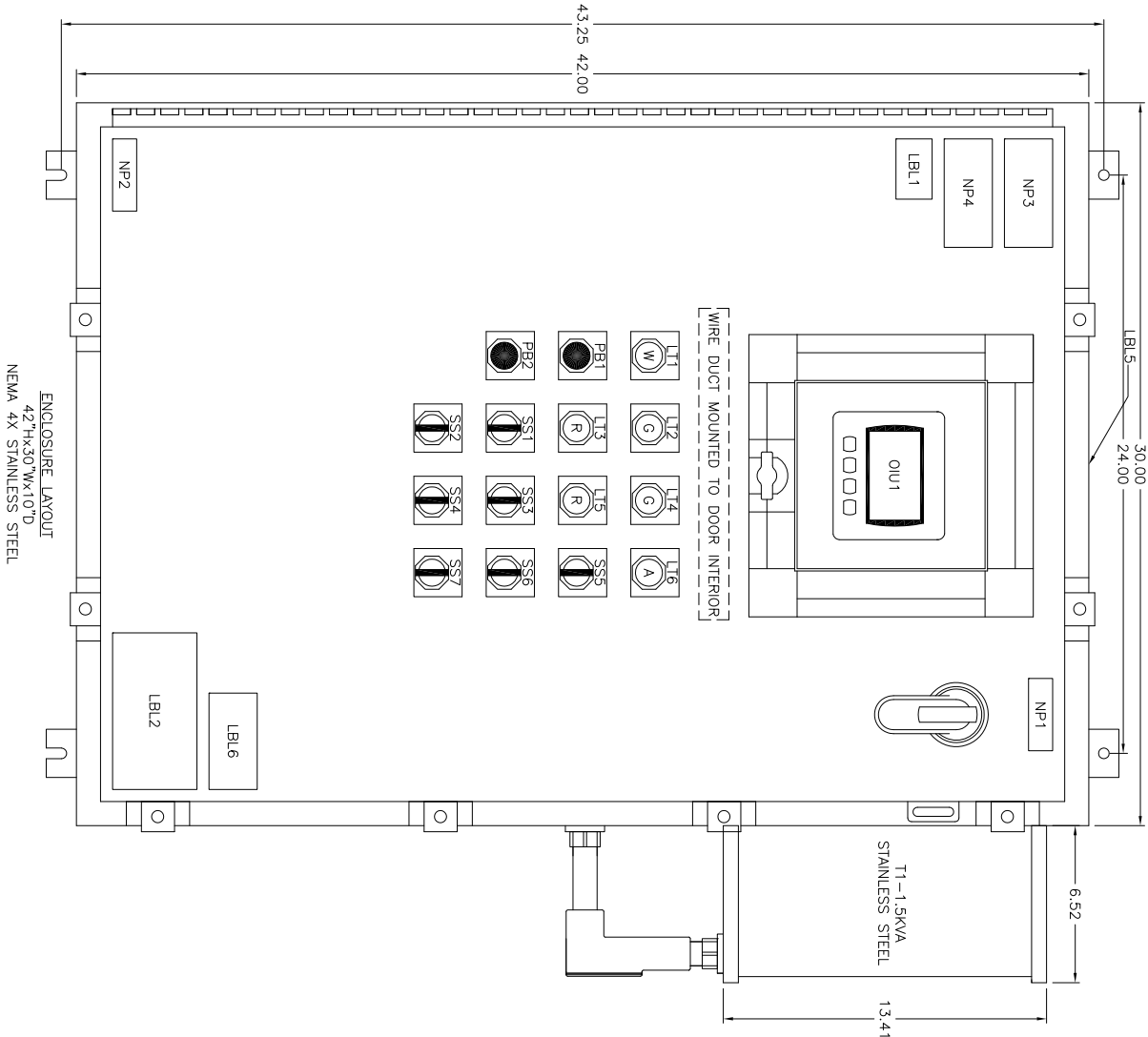
LABELS:
LBL1 - NOTICE:
- PENETRATIONS TO CONTROL CABINETS
MUST BE FITTED WITH TYPE 4 FITTINGS,
MYERS BRAND OR EQUAL
- ALL INTERIOR DEVICES MUST BE
PROTECTED FROM INSTALLATION DEBRIS
FAILURE TO ADHERE TO INSTRUCTIONS WILL
VOID WARRANTY



SEPTAGE HAULER ACCESS STATION
CONTROL PANEL

SIZE	DRAWN BY:	DWG NO.	REV
C	MWS	EC213208 - EVC5601B	0
SCALE: NONE	DATE: 01/06/13	SHEET 4 OF 4	

HINGED WINDOW W/WINGKNOB
11.8"Hx11.8"W WINDOW
8.0"Hx8.0"W VIEWABLE



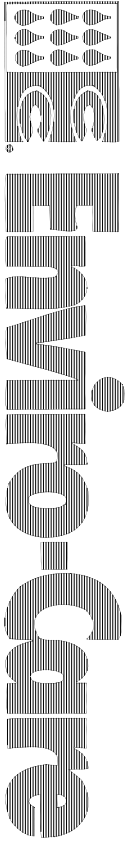
- PILOT DEVICE LEGEND PLATES:**
- LIT1 – CONTROL POWER ON
 - LIT2 – DRUM RUNNING
 - LIT3 – DRUM FAULT
 - LIT4 – SCREW SCREEN RUNNING
 - LIT5 – SCREW SCREEN FAULT
 - LIT6 – HIGH LEVEL
 - PBT1 – EMERGENCY STOP
 - SS1 – SYSTEM RESET
 - SS2 – DRUM
 - SS3 – SCREW SCREEN
 - SS4 – SCREW SCREEN
 - SS5 – BASKET SPRAY
 - SS6 – COMP. ZONE SPRAY
 - SS7 – SCREENING FLUSH
 - DB1 – HAND-OFF-AUTO
 - DS1 – FOR-OFF-REV
 - TS1 – FOR-OFF-AUTO
 - TS2 – HAND-OFF-AUTO
 - TS3 – HAND-OFF-AUTO
 - TS4 – HAND-OFF-AUTO
 - TS5 – HAND-OFF-AUTO
 - TS6 – HAND-OFF-AUTO
 - TS7 – HAND-OFF-AUTO

NAMEPLATES:

- NP1 – 480VAC-3PH-60HZ
- NP2 – INTRINSICALLY SAFE CIRCUITS
- NP3 – CONTROL PANEL PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS I, GROUPS A, B, C, D; CLASS II, GROUPS E, F, G; CLASS III HAZARDOUS LOCATIONS WHEN CONNECTED PER PEPPERL & FLUHS INSTALLATION DRAWING NO. 116-0145
- NP4 – CONTROL PANEL PROVIDES INTRINSICALLY SAFE CIRCUIT EXTENSIONS FOR USE IN CLASS I, GROUPS A,B,C,D; CLASS II, GROUPS E,F,G; CLASS III HAZARDOUS LOCATIONS WHEN CONNECTED PER GEM SENSORS FORM 270, SHEET P/N 100274-1, REV. H

LABEL DESCRIPTION:

- LBL1 – WARNING: MULTIPLE SUPPLY SOURCES OPEN ALL DISCONNECTS BEFORE SERVICING EQUIPMENT OR OTHER UNIT WIRING.
- LBL2 – DANGER HIGH VOLTAGE ENTRY BY QUALIFIED PERSON ONLY
- LBL3 – WARNING SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY
- LBL4 – INTRINSICALLY SAFE FIELD WIRING TERMINALS DAMAGE RESULTING FROM INSTALLATION OF TOP ENTRY CONDUIT WILL VOID WARRANTY
- LBL5 – WARNING – USE PROPER FITTINGS, MEYERS TYPE 4 OR EQUAL – PROTECT INTERIOR DEVICES FROM INSTALLATION DEBRIS
- LBL6 – DANGER ARC FLASH AND SHOCK HAZARD FOLLOW ALL REQUIREMENTS NFPA 70E FOR SAFE WORK PRACTICES AND FOR PERSONAL PROTECTIVE EQUIPMENTS.



BEAST – SEPTAGE RECEIVING
CONTROL PANEL

SIZE	DRAWN BY:	DWG. NO.	REV
C	MWS	EC213208 – EVC5601A	0
SCALE: NONE	DATE: 01/06/13	SHEET 8 of 8	

EleMech, Inc.

PortALogic

A Product of EleMech, Inc.



DS-22 Waste Dump Station

PortALogic Management Software Included

For Secure Hauler Access and Controlling

Receiving waste such as septage, fats-oils, grease, and sludge is an essential process in need of critical attention. Managing hauled-in waste irresponsibly could have adverse effects. Without an efficient process in place, it can also be costly. You see firsthand the challenges your facility faces and understand the importance of security, record keeping, and minimizing costs. Ensuring your waste receiving process is successful matters to you and to us.


We are EleMech, we created PortALogic stations to help you manage trucked in waste. Our sole mission with PortALogic is to help facilities manage waste responsibly while decreasing costs through our automated waste receiving stations. Since 2000, facilities have been looking to us to provide stations to meet their unique needs. Get started with us and let us help you meet your goals.

Buy Now - Call EleMech, Inc. at 630-499-7080 to order a station for your site

PortALogic Waste Dump Station - Model DS-22

DS-22

The DS-22 waste dump station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card and includes a pedestal base with an electrically actuated valve. It seamlessly communicates with PortALogic management software.

SPECIFICATIONS	
Enclosure	Access door- locking handle, water tight, outdoor rated NEMA 4X, corrosion resistant, stainless steel
Hauler Access	Industrial display with card reader and keypad
Receipt Printer	Heavy duty kiosk-style printer, illuminated chute, large capacity roll
Pedestal Base	NEMA 4X stainless steel enclosure, 24" wide. Encloses quick opening electrically actuated valve (4" or 6")
Power	120VAC, 30 AMP
Rate of Flow	Up to 1,100 gallons per min (4,164 liters per min)
Temperature	Operating temperature range -40°F to 122°F (-40°C to 50°C)
Software	Station interfaces with PortALogic management software for record keeping, billing, monitoring, and reporting
Certifications	

TYPES OF WASTE

Septage
Fats-Oils-Grease (FOG)
Sludge
Frac Water
Other Waste



Edgartown, MA



PortALogic Waste Dump Station - Model DS-22

OPTIONS

Sampler	Refrigerated samplers can be included in the system
pH Transmitter	pH monitors can be included in the system
Solar Powered	Stations can be powered by solar energy for remote installations
Cold Climate Package	Heaters, insulation, and heat tracing can be added to protect the station in cold climates
Hot Climate Package	Air conditioners and sunshields can be added to protect the station in hot climates
Gate/Door Control	The station can interface with automatic gates and doors if needed

HAULER ACCESS STATION OPERATION

1.	Hauler connects truck to inlet connection
2.	Hauler turns the switch to "Start"
3.	Hauler uses wipe card or enters PIN
4.	Hauler follows display prompts and enters information such as waste type
5.	Inlet valve opens, "System Ready" light illuminates, and hauler discharges
6.	Hauler turns the switch to "Done" and a receipt is printed detailing the transaction

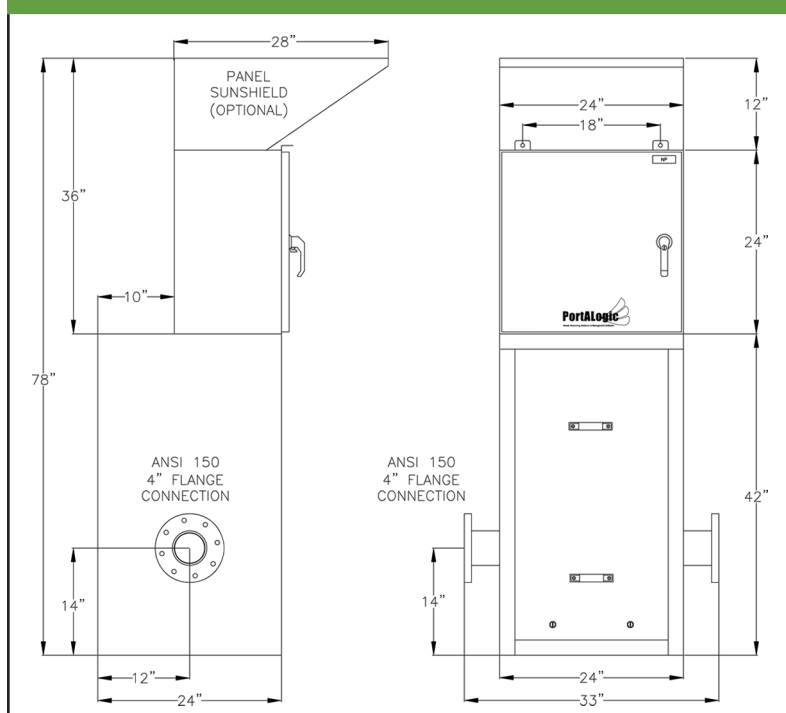
INSTALLATION

Stations come fully assembled, tested, and ready to install. The station comes with PortALogic management software which can be installed on any number of the facility's PCs.

WARRANTY

All components furnished in specification are guaranteed for two years from date of shipment. Management software updates and phone support is provided for two years from date of shipment.

DIMENSIONS



Features

- 1 Secure Hauler Login**
 - Haulers enter PIN or use swipe card to gain access
- 2 Simple to Use**
 - Display guides haulers through process and prompts hauler for information
- 3 Durable and Tamper-Proof**
 - Stainless steel and built to last
 - Lockable doors, tamper-proof card reader/keypad
- 4 Controls Hauler Access to Valve**
 - Electrically actuated valve in base opens only to permitted haulers

PortALogic Waste Products:



DS-200

The DS-200 waste dump station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card.



DS-22

The DS-22 waste dump station is secure and controls the valve. This station includes a pedestal base enclosing an electrically actuated valve.



DS-25

The DS-25 waste dump station is secure, controls the valve, and provides metering. This station encloses an electrically actuated valve and flow meter.



DS-82

The DS-82 waste dump station is the complete solution for waste receiving. This station encloses an electrically actuated valve, flow meter, sampler, and pH sensor.



For more information about PortALogic, please contact an EleMech engineer at 630-499-7080 or visit www.portalogic.info.

EleMech, Inc.
2275 White Oak Circle
Aurora, IL 60502
Office: 630-499-7080
www.portalogic.info
www.elemechanics.com

PortALogic

A Product of EleMech, Inc.



DS-200 Waste Dump Station

PortALogic Management Software Included

For Secure Hauler Access

Receiving waste such as septage, fats-oils, grease, and sludge is an essential process in need of critical attention. Managing hauled-in waste irresponsibly could have adverse effects. Without an efficient process in place, it can also be costly. You see firsthand the challenges your facility faces and understand the importance of security, record keeping, and minimizing costs. Ensuring your waste receiving process is successful matters to you and to us.

We are EleMech, we created PortALogic stations to help you manage trucked in waste. Our sole mission with PortALogic is to help facilities manage waste responsibly while decreasing costs through our automated waste receiving stations. Since 2000, facilities have been looking to us to provide stations to meet their unique needs. Get started with us and let us help you meet your goals.


Buy Now - Call EleMech, Inc. at 630-499-7080 to order a station for your site

PortALogic Waste Dump Station - Model DS-200

DS-200

The DS-200 waste dump station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card. It seamlessly communicates with PortALogic management software.

SPECIFICATIONS

Enclosure	Access door- locking handle, water tight, outdoor rated NEMA 4X, corrosion resistant, stainless steel
Hauler Access	Industrial display with card reader and keypad
Receipt Printer	Heavy duty kiosk-style printer, illuminated chute, large capacity roll
Power	120VAC, 30 AMP
Temperature	Operating temperature range -40°F to 122°F (-40°C to 50°C)
Software	Station interfaces with PortALogic management software for record keeping, billing, monitoring, and reporting
Certifications	

TYPES OF WASTE

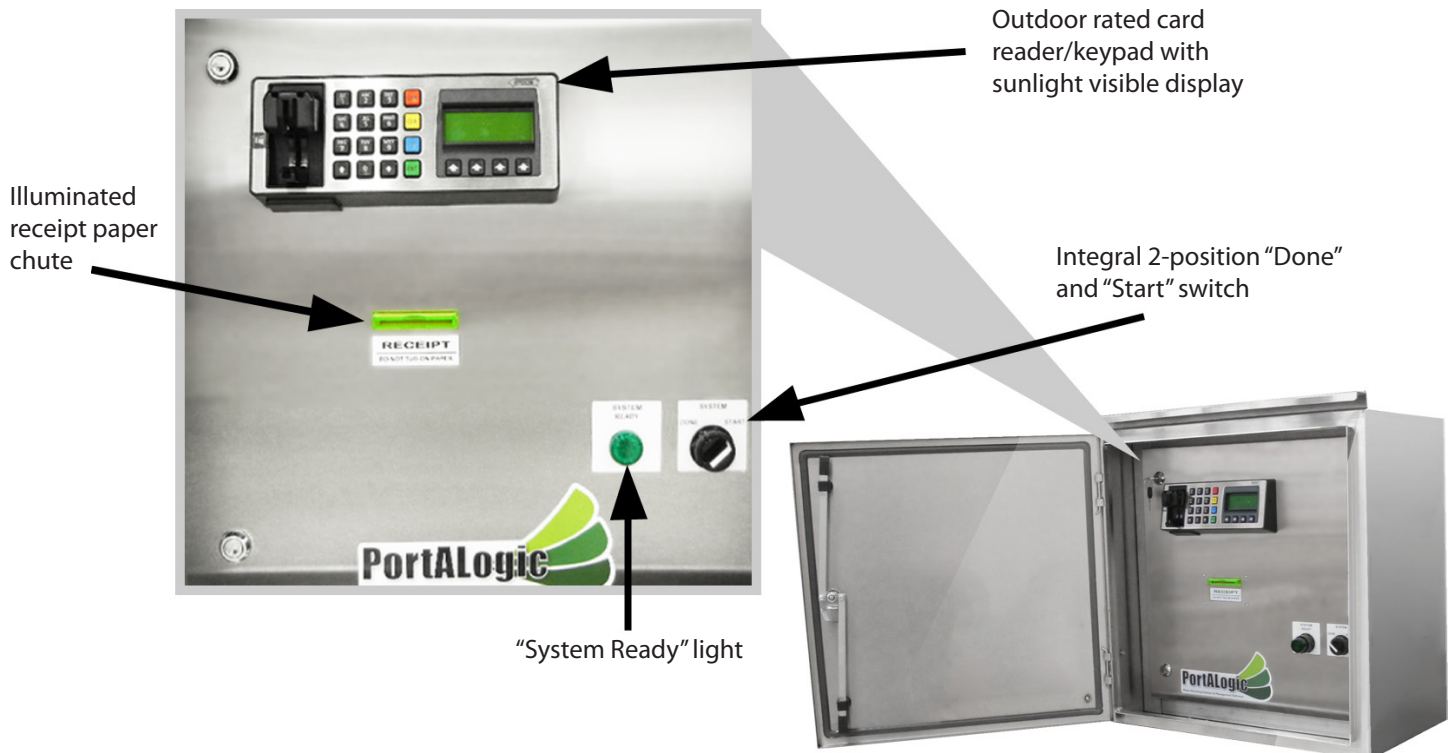
Septage
Fats-Oils-Grease (FOG)
Sludge
Frac Water
Other Waste



Warsaw, IN

WARRANTY

All components furnished in specification are guaranteed for two years from date of shipment. Management software updates and phone support is provided for two years from date of shipment.



PortALogic Waste Dump Station - Model DS-200

OPTIONS

Sampler	Refrigerated samplers can be included in the system
pH Transmitter	pH monitors can be included in the system
Solar Powered	Stations can be powered by solar energy for remote installations
Cold Climate Package	Heaters, insulation, and heat tracing can be added to protect the station in cold climates
Hot Climate Package	Air conditioners and sunshields can be added to protect the station in hot climates
Gate/Door Control	The station can interface with automatic gates and doors if needed

HAULER ACCESS STATION OPERATION

1.	Hauler connects truck to inlet connection
2.	Hauler turns the switch to "Start"
3.	Hauler uses wipe card or enters PIN
4.	Hauler follows display prompts and enters information such as waste type
5.	Inlet valve opens, "System Ready" light illuminates, and hauler discharges
6.	Hauler turns the switch to "Done" and a receipt is printed detailing the transaction

INSTALLATION

Stations come fully assembled, tested, and ready to install. The station comes with PortALogic management software which can be installed on any number of the facility's PCs.

Features

1 Secure Hauler Login

- Haulers enter PIN or use swipe card to gain access

3 Durable and Tamper-Proof

- Stainless steel and built to last
- Lockable doors, tamper-proof card reader/keypad

2 Simple to Use

- Display guides haulers through process and prompts hauler for information

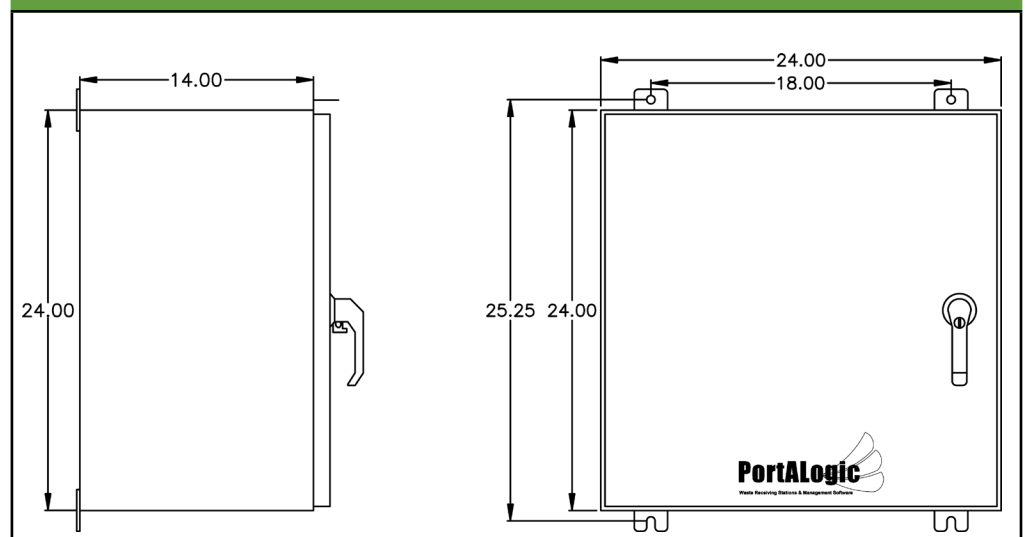
4 Prints Hauler Receipts

- Once waste is unloaded, a detailed receipt is printed
- Receipts can be emailed too



Grimsby, Ontario

DIMENSIONS



PortALogic Waste Products:



DS-200

The DS-200 waste dump station is tamper-proof and simple for haulers to use. This station provides secure hauler access by PIN or swipe card.



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DS-82

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JWC Environmental

BUDGET QUOTATION #MB2016-02-18_STANTEC_AQS_SRS3235-XE
NH WWTP / Katherine Hedberg - Stantec
SRS Honey Monster
With HOT Trap

QUOTE DATE: February 18, 2016

REPRESENTATIVE: AQS (Chris Shea)
SUBMITTALS: 8 weeks
SHIP EQUIPMENT: 12-14 weeks after release

TERMS: Net 30 days
PRICING: Valid for 90 days
FREIGHT: Included

We thank you for your inquiry and are pleased to quote pricing and delivery on the equipment listed below. This quotation is subject to the terms and conditions listed on the JWC Environmental "Terms and Conditions" page, and any comments and exceptions listed below.

HOT-SRS3235-XE Billing

One (1) SRS3235-XE Honey Monster™ Septage Receiving System suitable for 400 GPM of septage material at approx. 10% d.s. (1000 GPM of clean water), as received from septage hauling trucks through 4" dia. transfer lines.

Scope of supply to include:

* 4" diameter cast aluminum 'cam and groove' inlet connector and 4" Schedule 10 304 stainless steel inlet piping components

* 30004T-1204 Muffin Monster™ grinder with 12" cutter stack using 7-tooth cam cutters in alloy steel, cartridge-style tungsten carbide mechanical seals with BUNA-N elastomers rated for 90 psi, green epoxy-coated ductile iron castings, 29:1 speed reducer and 5 HP TEXP 230-460v/3ph/60Hz electric motor

* 4" plug valve and actuator with analog inputs for proportional control
* 4" Endress Hauser magnetic flow meter

* 304 stainless steel tank with 4" dia. Class 150 inlet flange, 12" dia. straight-pipe liquid discharge, hinged tank lid, downstream inspection port, ultrasonic level transducer with analog outputs, upper and lower stainless steel spray wash assemblies with manual & explosion-proof bronze solenoid valves (recommended wash water supply: 30 GPM at minimum 30 psi in 1" line).

* Easy to service pivoting auger assembly, 35deg inclination, 304 stainless steel trough & casings, 1/4" (6mm) perforated screen, nom. 20" dia. Alloy steel spiral with nylon brush, 12" dia. 304 stainless steel transport spiral with tapered element, 500mm transport segment length, dewatering bottom discharge segment allowing approx. 75" discharge clearance, 160:1 speed reducer, 2 HP TEXP 230-460v/3ph/60Hz electric motor coated with green epoxy paint

One (1) PC2450 motor controller in a NEMA 4X 304 stainless steel enclosure accepting 230-460v/3ph/60Hz input power, includes IEC starters with over-current protection, jam-sensing current transformers, micro - PLC with operator interface, start & stop pushbuttons, card swipe reader with 50 cards, closed-loop control system to maintain tank material level for optimum throughput/solids washing, transaction printer, and choice of on-board flash card drive or RS232 data port, (for connection to remote PLC or computer).



290 Paularino Avenue
Costa Mesa, CA 92626
phone (949) 833-3888
toll-free (800) 331-2277
fax (949) 833-8858
jwce@jwce.com

One (1) GRA0103-1804 Heavy Object Trap fabricated in 304 stainless steel with 4" Class 150 inlet & outlet flanges, lid, bar screen elements, removable debris basket, spray nozzles, 2" drain with manual ball valve, 3/4" hot water inlet with manual ball valve.

Screen Notes:

1. See attached standard JWC Terms and Conditions of Purchase.
2. Anchor bolts are to be provided by others and are to be appropriate to the physical conditions and equipment.

Four (4) Operation and Maintenance manuals

Budget Price Each: \$147,643.00

PRICE ADDER for 24" Trap in lieu of 18"

One (1) GRA0103-2404 Heavy Object Trap fabricated in 304 stainless steel with 4" Class 150 inlet & outlet flanges, lid, bar screen elements, removable debris basket, spray nozzles, 2" drain with manual ball valve, 3/4" hot water inlet with manual ball valve.

Budget Price Each: \$ 3,528.00

Comments:

1. Standard one year warranty is included.
2. Estimated weight of unit is 6150 lbs.
3. Freight is included in this pricing.
4. One (1) Start up service is included in this proposal.

Unless specifically stated above, this quotation does not include installation, any taxes, disconnect switches, anchor bolts, hydraulic fluid, mounting frames, spare parts, or special tools.

Authorized JWC Signature: Marc Beaudry (Eastern Sales Operations Manager) marc@jwce.com

Continued on the next page





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Costa Mesa, CA 92626
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toll-free (800) 331-2277
fax (949) 833-8858
jwce@jwce.com

LIMITED WARRANTY

Subject to the terms and conditions hereof, JWC Environmental (the "Company") warrants until one year after the operation start-up (written start-up date notification required) of the system of which such product is a part or until 18 months after delivery of such product to Buyer, whichever is earlier, that each product will be free of defects in materials and workmanship. If (a) the Company receives written notification of such defect during the warranty period and the defective Product's use is discontinued promptly after the defect is discovered by the person who then owns the defective Product (the "Owner") and (b) if the Owner forwards the product to the Company's nearest service/repair facility, transportation and related insurance charges prepaid, the Company will cause any products whose defect is covered under this warranty to either be replaced or repaired at no cost to the Owner. The foregoing warranty does not cover repairs required due to repair or alteration other than by the Company's personnel, accident, neglect, misuse, wear whether ordinary or extraordinary, transportation or causes other than ordinary use and maintenance in accordance with the Company's instructions and specifications. In addition, the foregoing warranty does not cover any Products, or components thereof, which are not directly manufactured for the Company. To the extent a warranty for repair or replacement of such Products or components not manufactured directly for the Company and not warranted by the Company is available to Buyer under agreements of the Company with its vendors, the Company will make such warranties available to Buyer. Costs of transportation of any covered defective item to and from the nearest service/repair center and related insurance will be paid or reimbursed by Buyer. Any replaced Products will become the property of the Company. Any replacement Products will be warranted only for the remaining term of the original limited warranty period and not beyond that term.

DISCLAIMER OF WARRANTIES AND LIMITATIONS ON LIABILITY

The foregoing limited warranty is the exclusive and only warranty with respect to the Products and shall be in lieu of all other warranties (other than the warranty of title), express, statutory or implied, including, but not limited to, any implied warranties of merchantability or fitness for a particular purpose and any statements made by employees or agents of the Company or others regarding the Products. The obligations of the Company under the foregoing warranty shall be fully satisfied by repair or replacement of the defective Product or part, as provided above. In no event shall the Company be liable for lost profits or other special, indirect or consequential damages, resulting from any breach of warranty of the Company or Buyer's ordering, using, owning or disposing of the Products covered hereby, even if the Company has been advised of the possibility of such damages. The total liability of the Company to Buyer and others arising from any cause whatsoever in connection with the Buyer's purchase, use and disposition of any Product covered hereby shall under no circumstances, exceed the purchase price paid for the Product by Buyer. No action, regardless of form, arising out of this agreement or based upon Buyer's purchase, use or disposition of the Products may be brought by either party more than one year after the cause of action accrues, except that any cause of action for the nonpayment of the purchase price may be brought at any time. Unless specifically agreed to in writing by the Company, no charges may be made to the Company by Buyer or any third party employed by Buyer for removing, installing, or modifying any Product. The Company and its representatives may furnish at no additional expense, data and engineering services relating to the application, installation or use of its Products by Buyer. The Company will not be responsible and it does not assume any liability whatsoever for damages of any kind sustained either directly or indirectly by any person through the adoption or use of such data or engineering services in whole or in part.

CHANGES IN PRODUCTS

The Company may make changes in materials, designs and specifications for its products without notice. The Company shall not incur any obligations to furnish or install any such changes or modifications on products previously ordered by or sold to Buyer.





BUDGET QUOTATION #MB2016-02-18A_STANTEC_AQS_SRS3235-XE

NH WWTP / Katherine Hedberg - Stantec

SRS Honey Monster

With Standard Rock Trap

QUOTE DATE: February 18, 2016

REPRESENTATIVE: AQS (Chris Shea)

SUBMITTALS: 8 weeks

SHIP EQUIPMENT: 12-14 weeks after release

TERMS: Net 30 days

PRICING: Valid for 90 days

FREIGHT: Included

We thank you for your inquiry and are pleased to quote pricing and delivery on the equipment listed below. This quotation is subject to the terms and conditions listed on the JWC Environmental "Terms and Conditions" page, and any comments and exceptions listed below.

HOT-SRS3235-XE Billing

One (1) SRS3235-XE Honey Monster™ Septage Receiving System suitable for 400 GPM of septage material at approx. 10% d.s. (1000 GPM of clean water), as received from septage hauling trucks through 4" dia. transfer lines.

Scope of supply to include:

* 4" diameter cast aluminum 'cam and groove' inlet connector and 4" Schedule 10 304 stainless steel inlet piping components

* 30004T-1204 Muffin Monster™ grinder with 12" cutter stack using 7-tooth cam cutters in alloy steel, cartridge-style tungsten carbide mechanical seals with BUNA-N elastomers rated for 90 psi, green epoxy-coated ductile iron castings, 29:1 speed reducer and 5 HP TEXP 230-460v/3ph/60Hz electric motor

* 4" plug valve and actuator with analog inputs for proportional control

* 4" Endress Hauser magnetic flow meter

* 304 stainless steel tank with 4" dia. Class 150 inlet flange, 12" dia. straight-pipe liquid discharge, hinged tank lid, downstream inspection port, ultrasonic level transducer with analog outputs, upper and lower stainless steel spray wash assemblies with manual & explosion-proof bronze solenoid valves (recommended wash water supply: 30 GPM at minimum 30 psi in 1" line).

* Easy to service pivoting auger assembly, 35deg inclination, 304 stainless steel trough & casings, 1/4" (6mm) perforated screen, nom. 20" dia. Alloy steel spiral with nylon brush, 12" dia. 304 stainless steel transport spiral with tapered element, 500mm transport segment length, dewatering bottom discharge segment allowing approx. 75" discharge clearance, 160:1 speed reducer, 2 HP TEXP 230-460v/3ph/60Hz electric motor coated with green epoxy paint

One (1) PC2450 motor controller in a NEMA 4X 304 stainless steel enclosure accepting 230-460v/3ph/60Hz input power, includes IEC starters with over-current protection, jam-sensing current transformers, micro - PLC with operator interface, start & stop pushbuttons, card swipe reader with 50 cards, closed-loop control system to maintain tank material level for optimum throughput/solids washing, transaction printer, and choice of on-board flash card drive or RS232 data port, (for connection to remote PLC or computer).



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jwce@jwce.com

One (1) "Rock" trap fabricated in 304 stainless steel with 4" Class 150 inlet & outlet flanges, fitted with 4" dia. knife gate valve for discharging collected solids.

Screen Notes:

1. See attached standard JWC Terms and Conditions of Purchase.
2. Anchor bolts are to be provided by others and are to be appropriate to the physical conditions and equipment.

Four (4) Operation and Maintenance manuals

Budget Price Each: \$137,075.00

Comments:

1. Standard one year warranty is included.
2. Estimated weight of unit is 5950 lbs.
3. Freight is included in this pricing.
4. One (1) Start up service is included in this proposal.

Unless specifically stated above, this quotation does not include installation, any taxes, disconnect switches, anchor bolts, hydraulic fluid, mounting frames, spare parts, or special tools.

Authorized JWC Signature: Marc Beaudry (Eastern Sales Operations Manager) marc@jwce.com

Continued on the next page





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LIMITED WARRANTY

Subject to the terms and conditions hereof, JWC Environmental (the "Company") warrants until one year after the operation start-up (written start-up date notification required) of the system of which such product is a part or until 18 months after delivery of such product to Buyer, whichever is earlier, that each product will be free of defects in materials and workmanship. If (a) the Company receives written notification of such defect during the warranty period and the defective Product's use is discontinued promptly after the defect is discovered by the person who then owns the defective Product (the "Owner") and (b) if the Owner forwards the product to the Company's nearest service/repair facility, transportation and related insurance charges prepaid, the Company will cause any products whose defect is covered under this warranty to either be replaced or repaired at no cost to the Owner. The foregoing warranty does not cover repairs required due to repair or alteration other than by the Company's personnel, accident, neglect, misuse, wear whether ordinary or extraordinary, transportation or causes other than ordinary use and maintenance in accordance with the Company's instructions and specifications. In addition, the foregoing warranty does not cover any Products, or components thereof, which are not directly manufactured for the Company. To the extent a warranty for repair or replacement of such Products or components not manufactured directly for the Company and not warranted by the Company is available to Buyer under agreements of the Company with its vendors, the Company will make such warranties available to Buyer. Costs of transportation of any covered defective item to and from the nearest service/repair center and related insurance will be paid or reimbursed by Buyer. Any replaced Products will become the property of the Company. Any replacement Products will be warranted only for the remaining term of the original limited warranty period and not beyond that term.

DISCLAIMER OF WARRANTIES AND LIMITATIONS ON LIABILITY

The foregoing limited warranty is the exclusive and only warranty with respect to the Products and shall be in lieu of all other warranties (other than the warranty of title), express, statutory or implied, including, but not limited to, any implied warranties of merchantability or fitness for a particular purpose and any statements made by employees or agents of the Company or others regarding the Products. The obligations of the Company under the foregoing warranty shall be fully satisfied by repair or replacement of the defective Product or part, as provided above. In no event shall the Company be liable for lost profits or other special, indirect or consequential damages, resulting from any breach of warranty of the Company or Buyer's ordering, using, owning or disposing of the Products covered hereby, even if the Company has been advised of the possibility of such damages. The total liability of the Company to Buyer and others arising from any cause whatsoever in connection with the Buyer's purchase, use and disposition of any Product covered hereby shall under no circumstances, exceed the purchase price paid for the Product by Buyer. No action, regardless of form, arising out of this agreement or based upon Buyer's purchase, use or disposition of the Products may be brought by either party more than one year after the cause of action accrues, except that any cause of action for the nonpayment of the purchase price may be brought at any time. Unless specifically agreed to in writing by the Company, no charges may be made to the Company by Buyer or any third party employed by Buyer for removing, installing, or modifying any Product. The Company and its representatives may furnish at no additional expense, data and engineering services relating to the application, installation or use of its Products by Buyer. The Company will not be responsible and it does not assume any liability whatsoever for damages of any kind sustained either directly or indirectly by any person through the adoption or use of such data or engineering services in whole or in part.

CHANGES IN PRODUCTS

The Company may make changes in materials, designs and specifications for its products without notice. The Company shall not incur any obligations to furnish or install any such changes or modifications on products previously ordered by or sold to Buyer.





**Fast
Grease
& Septage
Screening**

Heavy Object Trap

Description

Turning used restaurant grease into a useful resource is becoming popular at wastewater treatment plants. Grease and other high-strength organics are pumped into sludge digesters to boost biogas production and increase the production of renewable energy. However, it's difficult dealing with the rocks, rags, silverware and plastics in the grease.

The new JWCE Heavy Object Trap (model GRS) makes it quick and easy to screen out trash and debris that causes damage to downstream pumps and systems.

The HOT is available in six sizes and features an adjustable bar screen with 1/2" or 1" (12 or 25mm) spacings. As grease trucks unload, rocks, rags, knives, plastics and other debris are captured. The Muffin Monster® grinder then homogenizes the liquid grease – breaking clumps into an easy to pump slurry.

Once unloading is complete a hot water washdown* flushes debris off the bars and into the perforated capture basket below. The truck driver or plant operator then opens the lid, removes the perforated basket and empties it into a trash bin.

Available flow rates:

- 4" pipe (100mm) - 400 GPM (25 l/s)
- 6" pipe (150mm) - 600 GPM (38 l/s)
- Flow Rate - max. 15 psi (1 bar)

Applications

- Grease receiving/screening
- Septage receiving/screening
- Sludge receiving/screening
- Wastewater treatment plants
- Private septage haulers

Options

- MonsterTrack™ billing controller
- Receipt printer
- Card lock
- Flow meter
- Plug valve

* Supplied by others.



Models

MODEL	Pipe Size - in.(mm)	Basket Capacity
GRS0103-1804	4 (100mm)	1.1 ft³ (0.03 m³)
GRS0103-2004	4 (100mm)	1.5 ft³ (0.04 m³)
GRS0103-2404	4 (100mm)	*2.2 ft³ (0.06 m³)
GRS0103-1806	6 (150mm)	1.1 ft³ (0.03 m³)
GRS0103-2006	6 (150mm)	1.5 ft³ (0.04 m³)
GRS0103-2406	6 (150mm)	*2.2 ft³ (0.06 m³)

*Lifting station recommended to empty basket



JWC
Environmental®
Trust Monster Quality™



A grease truck unloads through the JWCE Heavy Object Trap and into a wastewater treatment plant's holding tank.



The screening bars use a unique design for max flow while capturing silverware, rags and plastics. A hot water washdown cleans the bars.



Heavy objects, rocks, silverware, rags and other debris drop or are washed into the perforated capture basket.



A Muffin Monster grinder in a grease receiving line.



Macerators work poorly in grease/waste receiving applications.



MonsterTrack billing controller features a card lock & receipt printer.

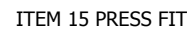


JWC
Environmental®

Trust Monster Quality™

(800) 331-2277 • (949) 833-3888 • www.jwce.com

1. INTERPRET DRAWING IN ACCORDANCE WITH ASME Y14.5M-1994 STANDARDS.
2. APPLY PIPE DOPE OR TEFLON PLUMBERS TAPE TO ALL THREADED PIPE FITTINGS.
3. USE REMOVABLE LOCTITE ON ITEM 7.



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 JWC ENVIRONMENTAL 290 PAULARINO AVE, COSTA MESA, CA 92626			
ASSEMBLY - HEAVY OBJECT TRAP 18" DIA TANK X 4" INLET / OUTLET GREASE RECEIVING SYSTEM - SERIES GRS			
SIZE D	DRAWING NO. GRA0103-1804	REV X1	
SCALE: 1/3	CAD MODEL: GRA0103-1804-001		SHEET 1 OF 1

DRAWING NO.

GRA0103-1804-CD

6

5

4

3

2

1

NOTES UNLESS OTHERWISE SPECIFIED:

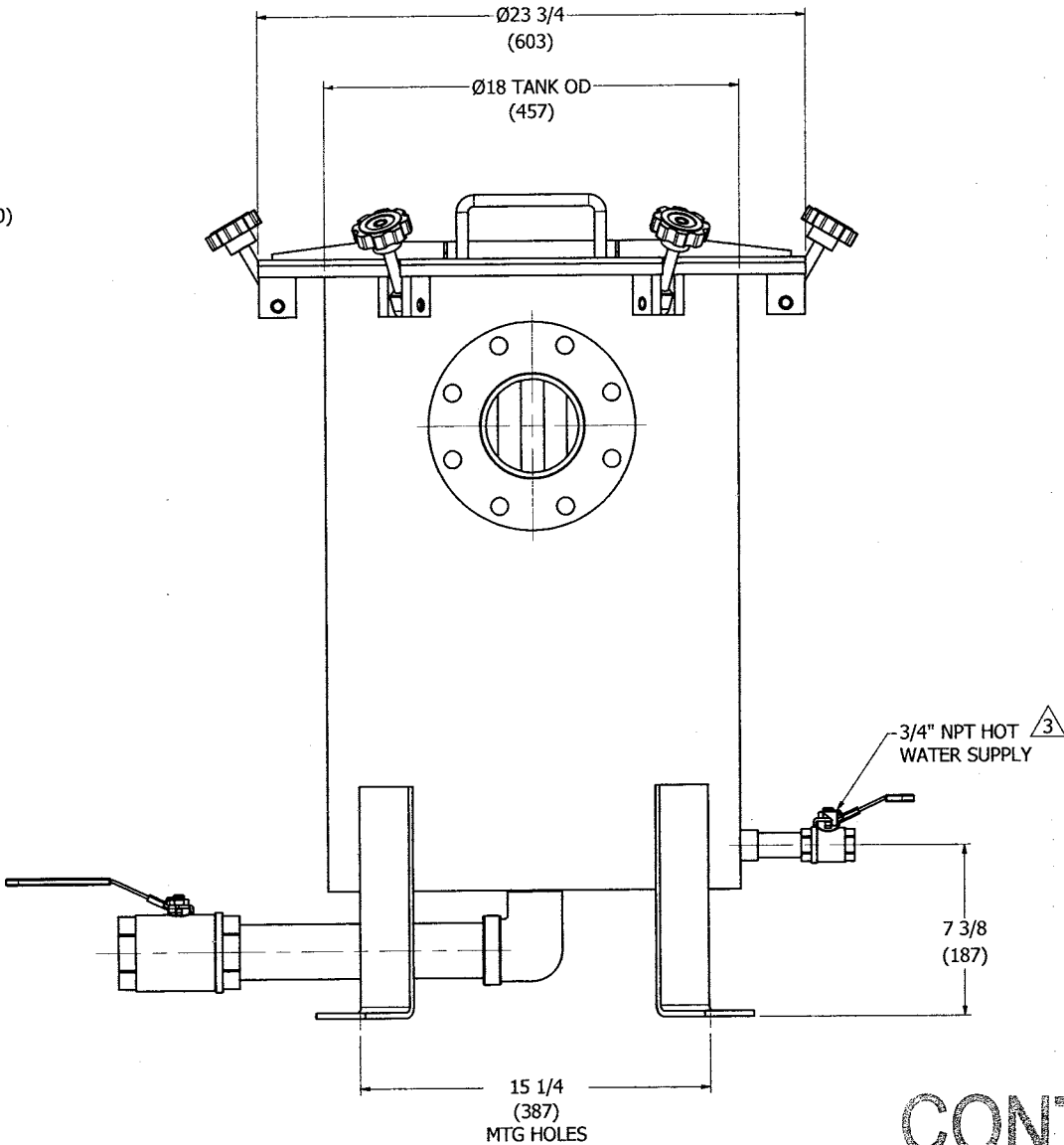
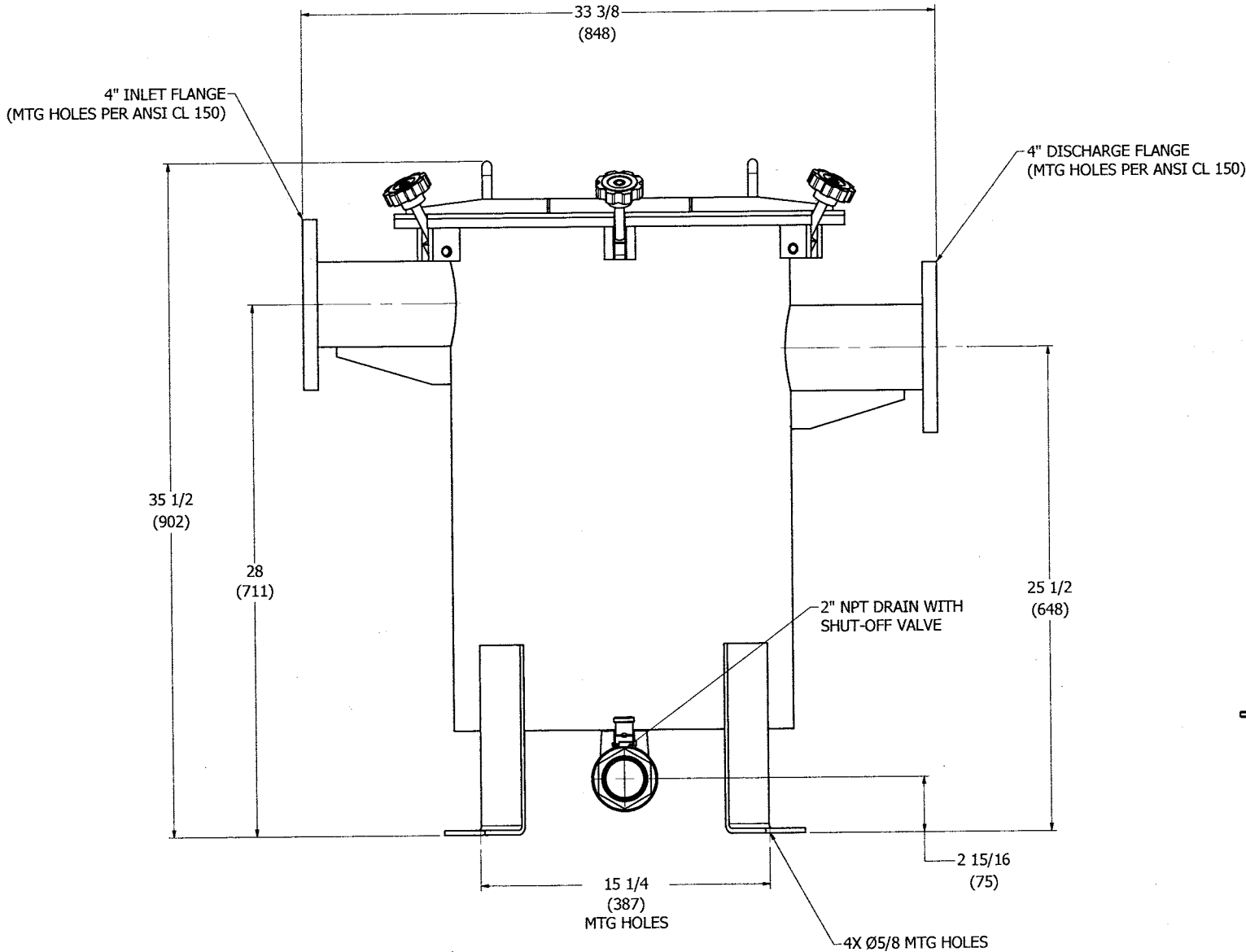
1. INTERPRET DRAWING IN ACCORDANCE WITH ASME Y14.5M-1994 STANDARDS.

2. COLLECTION BASKET WEIGHT: DRY = 17 LBS, FILLED WITH DEBRIS = APPROXIMATELY 51 LBS.

3. HOT WATER SUPPLY IS BASED ON 3/4" NPT @ 40-90 PSI, WITH A MINIMUM TEMPERATURE OF 120° F INTO THE TANK. TWO SPRAY NOZZLES FOR HOT WATER WASH @ 4 GPM EACH.

4. TOTAL SYSTEM DRY WEIGHT: 280 LBS.

REVISION HISTORY									
ZONE	REV	DESCRIPTION				ECO NO.	DATE	CHK	PE
ALL	A	INITIAL RELEASE				SR-0131	9/12/12	10	22



CONTROLLED

ALL RIGHTS RESERVED

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1	1	GRA0103-1804	HEAVY OBJECT TRAP, 18" DIA STATIC	304 SST / 316 SST
ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES				
FRACTIONS	DECIMALS	ANGLES	CONTRACT NO.	
± 1/16	.XX ± .03	± 1/2°	APPROVALS	DATE
MATERIAL LISTED			DRAWN D. ROLAND	9/12/12
FINISH 250/(CAST) 125/(MACHINED)			CHECKED T. NYDM	1-22-13
DO NOT SCALE DRAWING			MANUF J. Quintana	1-29-13
			Q.C. [Signature]	1-30-13
			JWC JWC ENVIRONMENTAL 290 PAULARINO AVE, COSTA MESA, CA 92626	
			HEAVY OBJECT TRAP - CONFIGURATION 18" DIA TANK X 4" INLET/OUTLET GREASE RECEIVING SYSTEM - SERIES GRS	
			SIZE D	REV A
			DRAWING NO. GRA0103-1804-CD	
			SCALE: 1/4	SHEET 1 OF 1
			CAD MODEL: GRA0103-1804-001	

DRAWING NO.

GRA0103-2404-CD

NOTES UNLESS OTHERWISE SPECIFIED:

1. INTERPRET DRAWING IN ACCORDANCE WITH ASME Y14.5M-1994 STANDARDS.

2. COLLECTION BASKET WEIGHT: DRY = 26 LBS, FILLED WITH DEBRIS = ESTIMATED 105 LBS.

3. HOT WATER SUPPLY IS BASED ON 3/4" NPT @ 40-90 PSI, WITH A MINIMUM TEMPERATURE OF 120° F.

TWO SPRAY NOZZLES FOR HOT WATER WASH @ 4 GPM EACH.

4. TOTAL SYSTEM DRY WEIGHT: 361 LBS.

4" INLET FLANGE
(MTG HOLES PER ANSI CL 150)

HINGED COVER
FOR CLEAN-OUT

4" DISCHARGE FLANGE
(MTG HOLES PER ANSI CL 150)

35 1/2
(902)

28
(711)

25 1/2
(648)

2 15/16
(75)

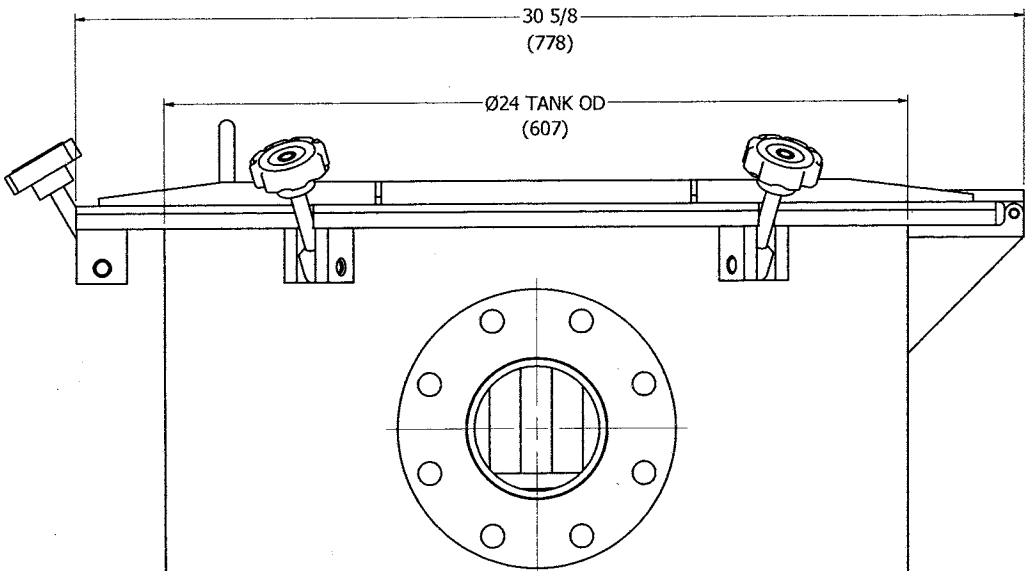
2" NPT DRAIN WITH
SHUT-OFF VALVE

19.56
(497)
MTG HOLES

4X Ø5/8 MTG HOLES

39 5/8
(1006)

REVISION HISTORY									
ZONE	REV	DESCRIPTION	ECO NO.	DATE	CHK	PE	MFG	QC	
ALL	A	INITIAL RELEASE	SR-0131	9/12/12					



3/4" NPT HOT
WATER SUPPLY

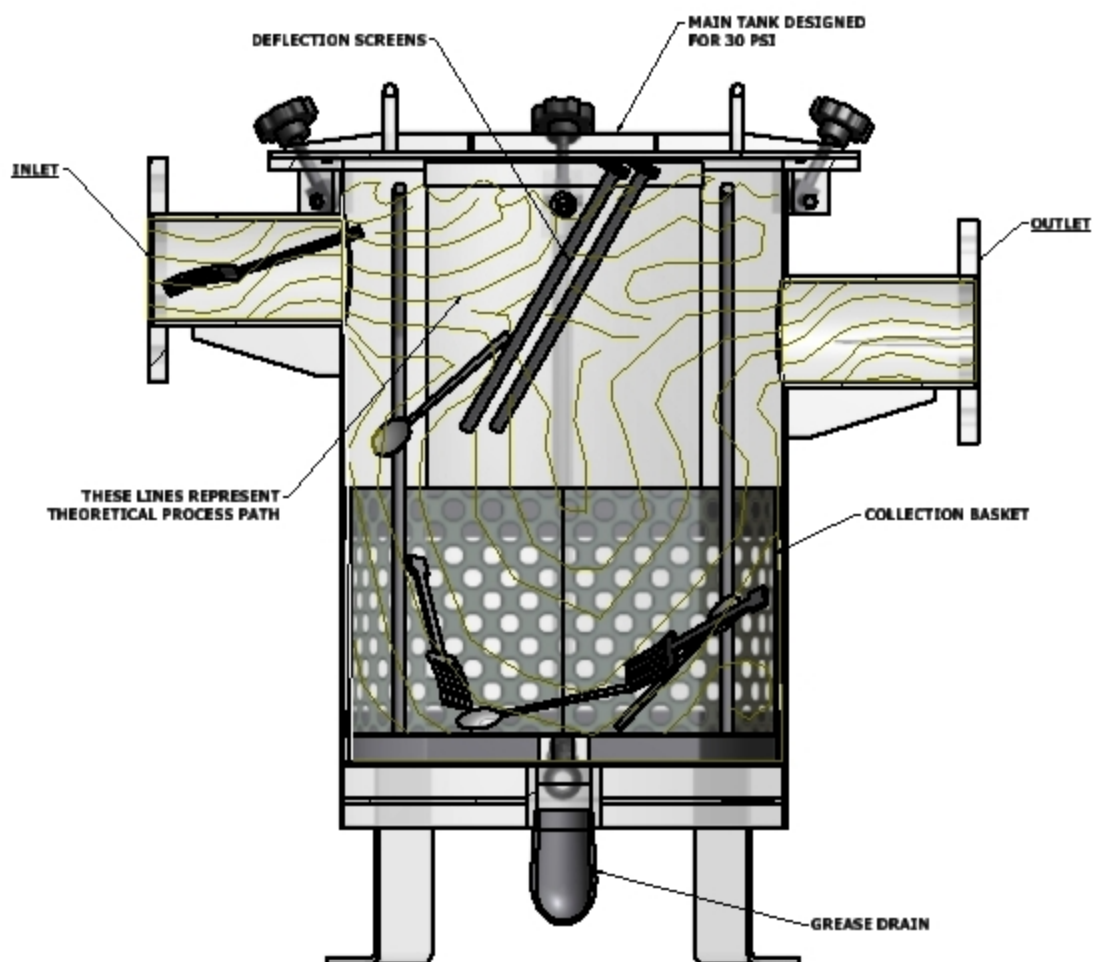
7 3/8
(187)

19.56
(497)
MTG HOLES

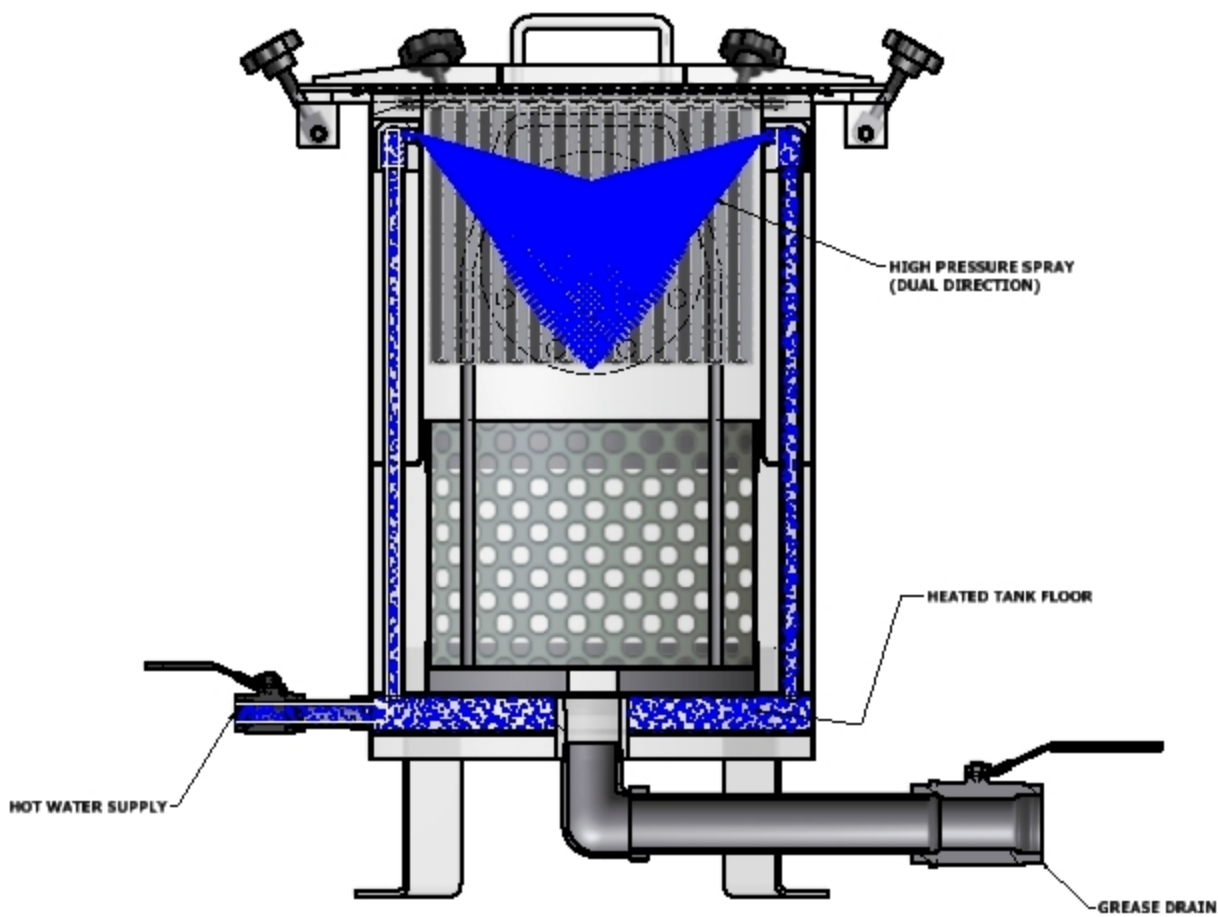
1	1	GRA0103-2404	HEAVY OBJECT TRAP, 24" STATIC	304 SST / 316 SST
ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES				
FRACTIONS	DECIMALS	ANGLES	CONTRACT NO.	
± 1/16	XX ± .03	± 1/2°	DRAWN	DATE
	XXX ± .005		D. ROLAND	9/12/12
MATERIAL LISTED		CHECKED	T. W. H. M.	
		MANUF.	1-22-13	
		Q.C.	1-29-13	
FINISH 250 ✓ (CAST) 125 ✓ (MACHINED)		DO NOT SCALE DRAWING	1-30-13	
			JWC ENVIRONMENTAL	
			290 PAULARINO AVE, COSTA MESA, CA 92626	
			HEAVY OBJECT TRAP - CONFIGURATION	
			24" DIA TANK X 4" INLET/OUTLET	
			GREASE RECEIVING SYSTEM - SERIES GRS	
SIZE	DRAWING NO.	REV		
D	GRA0103-2404-CD	A		
SCALE: 1/3	CAD MODEL: GRA0103-2404-001-02-03	SHEET 1 OF 1		

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CONTROLLED



GREASE FLOW DIAGRAM

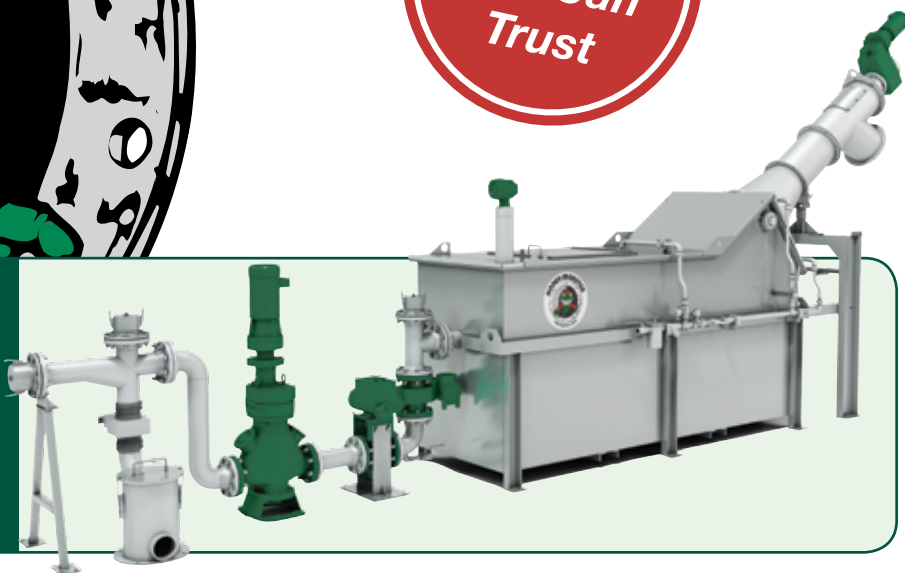


HOT WATER DIAGRAM



Honey Monster®

Septage and Grease Receiving Systems



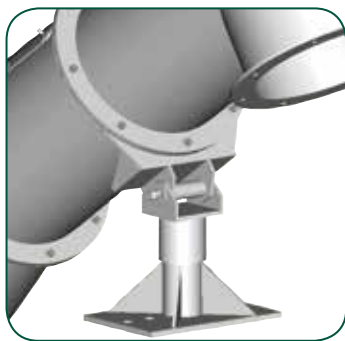
Overview

The automated Honey Monster receiving and screening system quickly tracks and screens septage, grease or sludge to remove unwanted debris. Our model SRS-XE system uses an auger screw and perforated screening basket with 1/4" (6mm) circular openings to remove rocks, rags, plastics, silverware and other trash. It provides complete protection for downstream equipment and the treatment plant.

The unique combination of grinding, solids removal, washing and dewatering allows a typical septage truck to unload in 5 to 15 minutes. The system is completely enclosed to ensure safety, vector control and to capture foul odors.

MonsterTrack™

The optional 'MonsterTrack' metering and control system uses a flow meter to track septage and provide accurate billing data for the facility and a receipt for the hauler.



Exclusive Tilt and Swivel Auger



Track Loads with MonsterTrack!

Features & Benefits

Advanced Screening and Dewatering

- Auger Monster screen with 1/4" (6mm) perforations removes unwanted solids and trash
- Perf screen captures far more than bar screens
- Patented dual compartment compaction zone provides significant additional dewatering

Easy Access, Pivoted Auger

- The auger is mounted to a pivot support for easy inspections and removal
- A forklift or crane can lift and swivel the screening trough and auger out of the tank

Dual-Shafted Grinder

- Muffin Monster® grinder maximizes surface area of solids for better washing and compacting

Triple-manifold Wash Water System

- Washes soft organics off of captured debris
- Ensures optimal throughput while minimizing odors

High Level Ultrasonic Sensor

- Regulates plug valve for optimum performance
- Baffles prevent overflow conditions

Optional 'MonsterTrack' System

- Records driver information and measures flow data
- PIN or card access for security
- Printed transaction receipts
- Data stored on compact flash card
- Ethernet/SCADA connection capable



JWC
Environmental®

Trust Monster Quality™

www.jwce.com



Septage Receiving with Automated Solids Removal

Honey Monster®

Model: SRS-XE



Materials of Construction

Tank, piping & Support: 304 stainless steel

Auger Assembly: Casings and trough are 304ss; rotor is 480mm Ø alloy steel

Grinder Housing: ductile iron housings ASTM A536-77

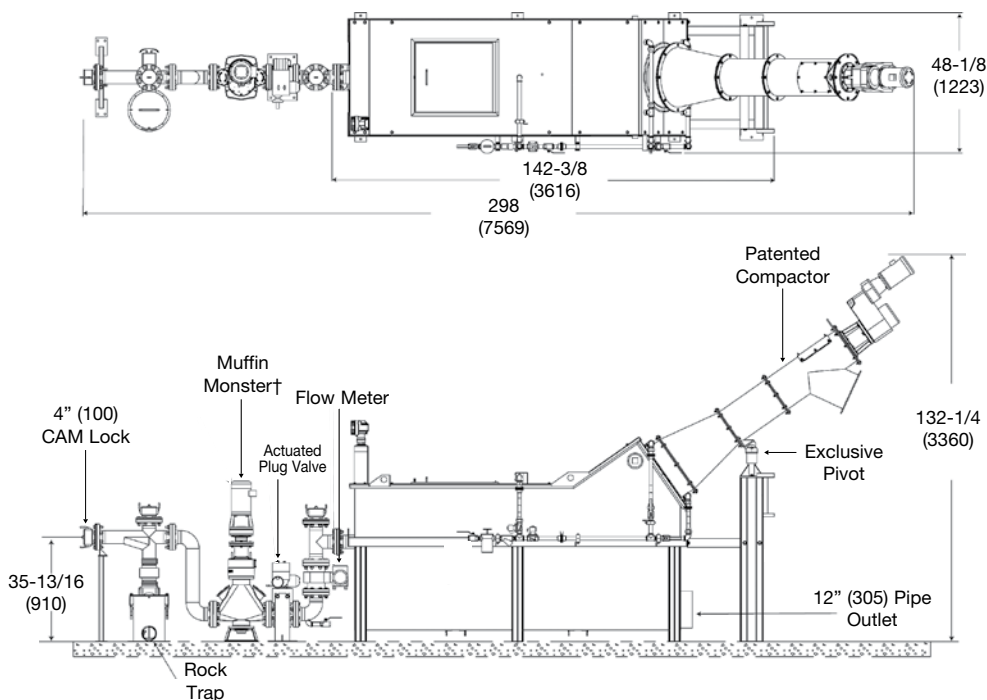
Cutters: 8620 carburized alloy steel, hardened to 60-65 Rockwell C

Mechanical Seal Faces: Tungsten carbide

Model	Screen Diameter	Auger Motor	Screenings Capacities	*Typical Septage Flow Capacity
SRS3235-XE	19" (480mm)	2 HP (1.5 kW)	90 ft ³ /h (2.55 m ³ /h)	400 gpm (25.2 l/s)

*Up to 1,000 gpm (63 l/s) through tank screen (clean water)

*Recommended max 15 psi (1 bar)



Configurations

1. Septage Screening
2. Sludge Screening
3. Grease Screening

Options

- Macho Monster grinder for higher-flows
- 6" (150mm) inlet pipeline
- Cold weather protection system
- Discharge bagger
- pH and conductivity sensing loop
- 316 stainless steel pipe and tank
- MonsterTrack billing controller
- Skid mounted system



Rock Trap



Shredded Material Moving Up the Auger Screw for Disposal



Cold Weather Protection and auto bagger



Grease Receiving Heavy Object Trap + Muffin Monster®

Model: GRS



Inside view of the
perforated basket

MODEL	Pipe Size - in.(mm)	Basket Capacity
GRS0103-1804	4 (100mm)	1.1 ft³ (0.03 m³)
GRS0103-2004	4 (100mm)	1.5 ft³ (0.04 m³)
GRS0103-2404	4 (100mm)	*2.2 ft³ (0.06 m³)
GRS0103-1806	6 (150mm)	1.1 ft³ (0.03 m³)
GRS0103-2006	6 (150mm)	1.5 ft³ (0.04 m³)
GRS0103-2406	6 (150mm)	*2.2 ft³ (0.06 m³)

*Lifting station recommended to empty basket

Overview

This trap features adjustable bar screens to capture and direct heavy objects into the debris basket. As trucks unload grease, the silverware, rags, knives and other large debris are removed. The Muffin Monster then homogenizes the grease – breaking grease solids into an easy to pump slurry. Optional MonsterTrack billing controller, flow meter and modulating plug valve are also available.

Flow Capacity

- 4" pipe - 400 GPM (25 l/s)
- 6" pipe - 600 GPM (38 l/s)
- Flow Rate - max. 15 psi

Features

- 5 HP (3.7 kW) Grinder Motor
- Hot Water Wash Down (supplied by others)
- Adjustable bar spacings 1/2" or 1" (12 or 25mm)

Septage Receiving Rock Trap + Muffin Monster®

Model: SRS3000



MODEL	Pipe Size- in.(mm)	Basket Capacity
SRS3000-1204	4 (100mm)	0.18 ft³ (0.005 m³)
SRS3000-1206	6 (150mm)	0.24 ft³ (0.007 m³)

Overview

This small rock trap is a good choice for small sites receiving only a few thousand gallons per day. The perforated screening basket has 1/2" (12mm) circular openings and captures rocks and silverware.

Flow Capacity

- 4" pipe - 400 GPM (25 l/s)
- 6" pipe - 600 GPM (38 l/s)
- Flow Rate - max. 15 psi

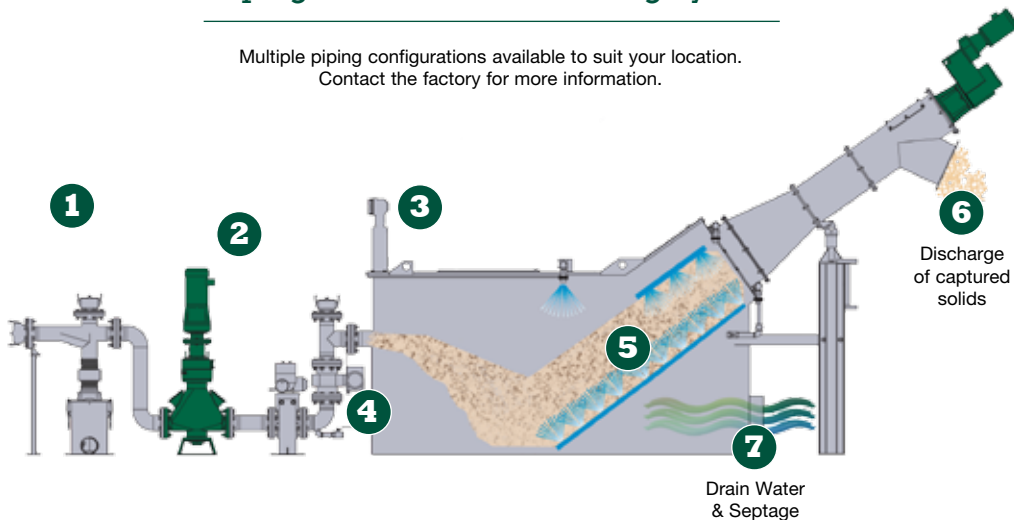
Features

- 5 HP (3.7 kW) Grinder Motor

Honey Monster®

Septage and Grease Receiving System

Multiple piping configurations available to suit your location.
Contact the factory for more information.



Operation

- 1) Haulers connect to the cam lock inlet and start the flow of septage which first passes through the rock trap.
- 2) Muffin Monster grinds-up solids.
- 3) Ultrasonic level sensor and modulating plug valve regulate flow.
- 4) If the 'MonsterTrack' option is installed, the flow meter sends data to the controller.
- 5) Septage and solids now enter the perf screening trough. Spray wash cleans the solids and keeps the screen clear.
- 6) The unwanted solids are captured by the inclined auger screen and transported to the compaction zone for additional dewatering before being discharged.
- 7) The screened septage now safely flows into the wastewater treatment plant.

Photo Gallery - Options



Skid Mounted System



Muffin Monster®



MonsterTrack™ Billing Controller



Heat Tracing and Blanket



Optional Endless Bagger


Headquarters
290 Paularino Ave.
Costa Mesa, CA 92626 USA
Toll Free: (800) 331-2277
Phone: (949) 833-3888
Fax: (949) 833-8858
jwce@jwce.com

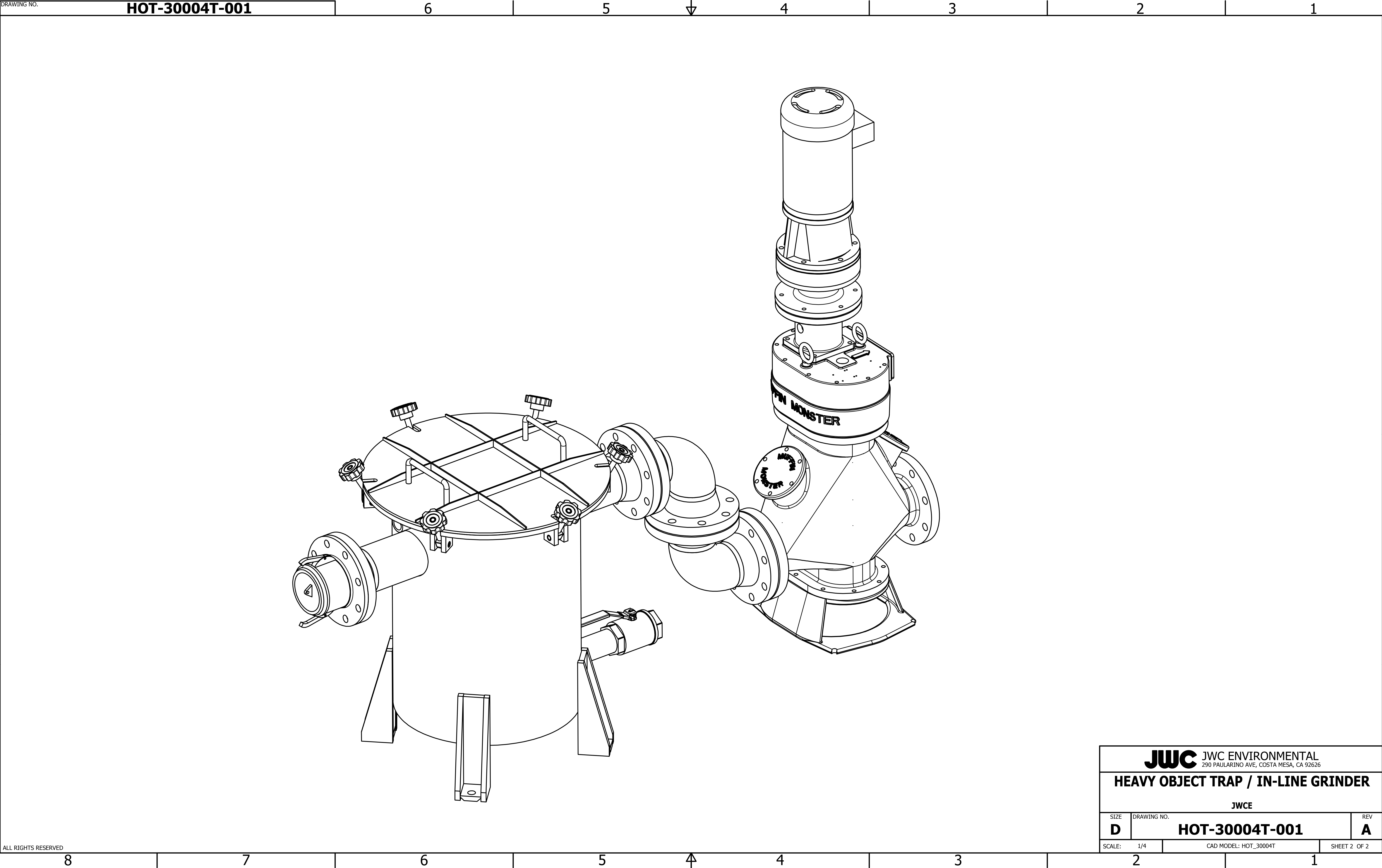
Western Customer Service
2600 S. Garnsey St.
Santa Ana, CA 92707, USA
Toll Free: (800) 331-8783
Phone: (770) 271-2106
Fax: (770) 925-9406
jwce@jwce.com

Eastern Customer Service
4485 Commerce Dr, Ste 109
Buford, GA 30518, USA
Toll Free: (800) 331-8783
Phone: (770) 271-2106
Fax: (770) 925-9406
jwce@jwce.com

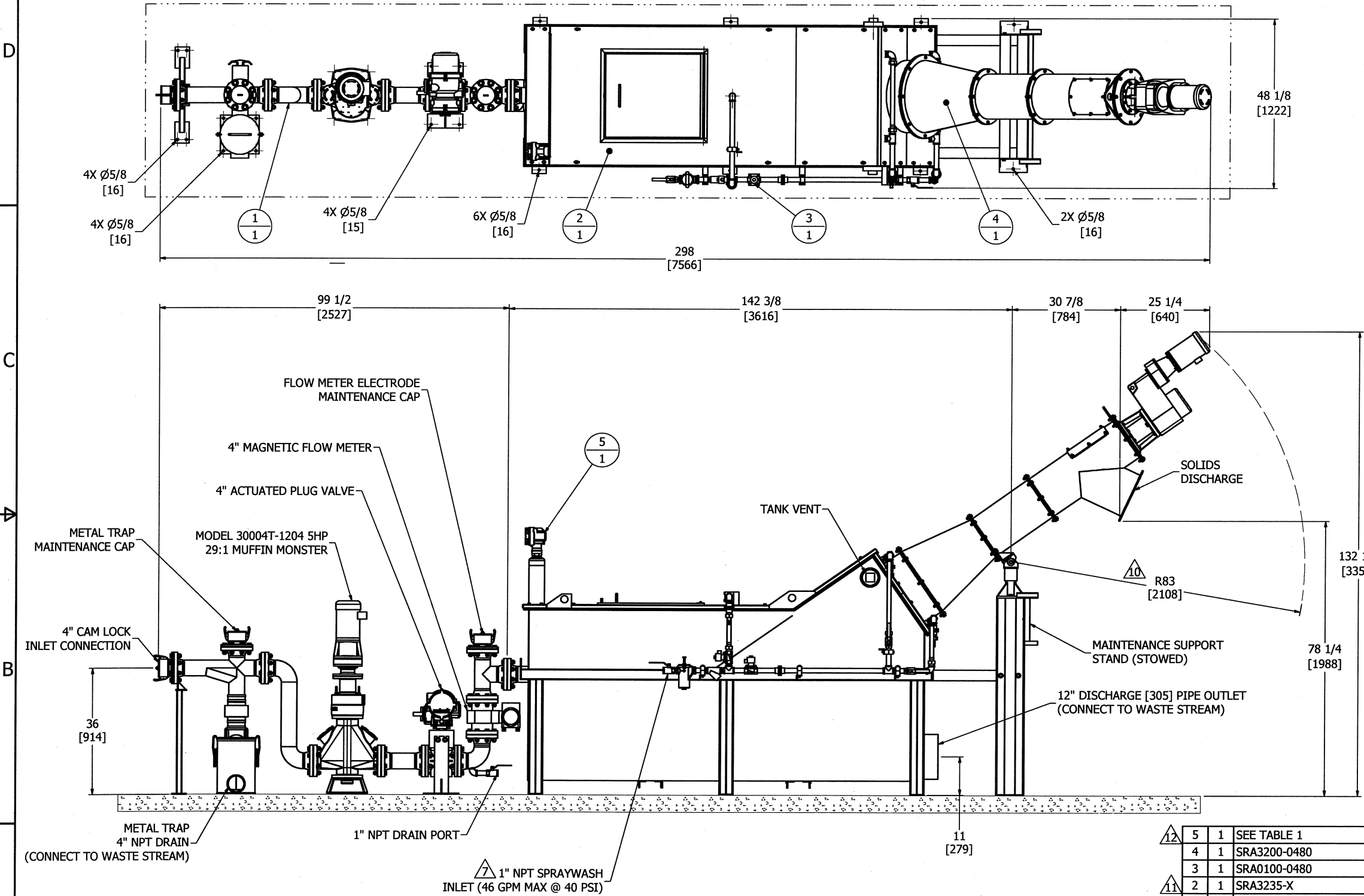


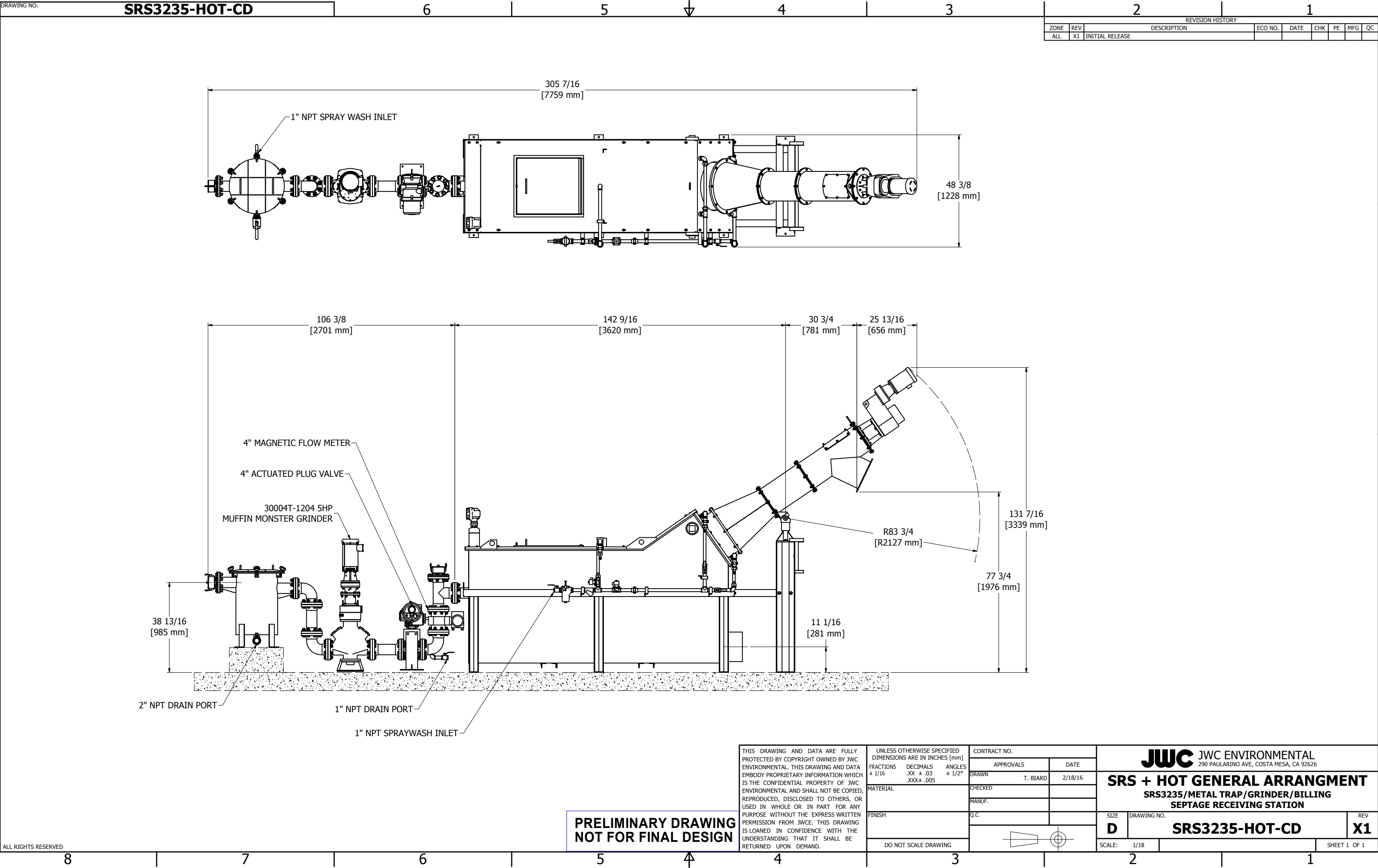
www.jwce.com

 JWC ENVIRONMENTAL 290 PAULARINO AVE, COSTA MESA, CA 92626			
HEAVY OBJECT TRAP / IN-LINE GRINDER			
JWCE			
SIZE D	DRAWING NO. HOT-30004T-001		REV A
SCALE: 1/4"	CAD MODEL: HOT_30004T		SHEET 1 OF 2



ZONE		REV	DESCRIPTION	ECO NO	DATE	CHK	PE	MFG	QC
ALL	A	INITIAL RELEASE		SR-0081	03/28/09	RS	RS	VQ	MC
ALL	B	REDRAWN IN INVENTOR, ADDED FLANGED TANK PART NUMBERS TO NOTE 11.		SR-0111	09/14/09	RS	RS		





DRAWING NO.

SRS3235-HOT-CD

6

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1

REVISION HISTORY

ZONE	REV	DESCRIPTION	ECO NO.	DATE	CHK	PE	MFG	QC
ALL	X1	INITIAL RELEASE						

D

D

C

C

B

B

A

A

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES [mm]		
FRACTIONS	DECIMALS	ANGLES
± 1/16	.XX ± .03	± 1/2°
	.XXX ± .005	
MATERIAL		
FINISH		
DO NOT SCALE DRAWING		

CONTRACT NO.	
APPROVALS	DATE
DRAWN T. BIARD	2/18/16
CHECKED	
MANUF.	
Q.C.	

JWC JWC ENVIRONMENTAL 290 PAULARINO AVE, COSTA MESA, CA 92626	
SRS + HOT GENERAL ARRANGMENT	
SRS3235/METAL TRAP/GRINDER/BILLING	
SEPTAGE RECEIVING STATION	
SIZE	REV
D	X1
DRAWING NO.	
SRS3235-HOT-CD	
SCALE: 1/18	SHEET 1 OF 1

SECTION 11330

HONEY MONSTER®

SEPTAGE RECEIVING STATION-SERIES SRS-XE

(Includes Grinder-XPFC Explosion Proof and MonsterTrack™ Data Collection)

PART 1 GENERAL

1.1 SUMMARY

- A. This section of the specification describes the septage receiving station(s) and controller(s). The equipment shall be installed as shown on the plans, as recommended by the supplier, and in compliance with all OSHA, local, state and federal codes and regulations.
- B. The number of septage receiving station(s) and controller(s) shall be _____.

1.2 REFERENCES

- A. Station(s) shall, as applicable, meet the requirements of the following industry standards:
 - 1. American Society for Testing and Materials (ASTM) A36: Standard Specification for Carbon Steel Plate
 - 2. American Society for Testing and Materials (ASTM) A536-84: Standard Specification for Ferritic Ductile Iron Castings
 - 3. American Society for Testing and Materials (ASTM) A48-83: Standard Specification for Grey Iron Casting
 - 4. American National Standards Institute (ANSI) B16.42-1979, Class 150 Flanges
 - 5. American Iron and Steel Institute (AISI) 303 Stainless Steel
 - 6. American Iron and Steel Institute (AISI) 304 Stainless Steel
 - 7. American Iron and Steel Institute (AISI) 316 Stainless Steel
 - 8. American Iron and Steel Institute (AISI) 4130 Heat Treated Alloy Steel
 - 9. American Iron and Steel Institute (AISI) 4140 Heat Treated Alloy Steel
 - 10. American Iron and Steel Institute (AISI) 8620 Heat Treated Alloy Steel
 - 11. American Iron and Steel Institute (AISI) 17-4 Stainless Steel
- B. Controllers shall, as applicable, meet the requirements of the following Regulatory Agencies:
 - 1. National Electrical Manufacturer's Association (NEMA) Standards
 - 2. National Electric Code (NEC)
 - 3. Underwriters Laboratory (UL and cUL)
 - 4. International Electrotechnical Commission (IEC)

PART 1 GENERAL (Cont'd)

1.3 DOCUMENTS

A. Submittals

Supplier shall submit six (6) sets of submittals. Submittals shall include equipment descriptions, functional descriptions, dimensional and assembly drawings, catalog data, and job specific drawings.

B. Operation and Maintenance manuals.

The supplier shall provide three (3) Operation & Maintenance manuals. An electronic version shall be supplied to create additional copies. The manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, a recommended schedule, and the recommended lubricants.

1.4 QUALITY ASSURANCE

A. Identification

1. Equipment shall be identified with a corrosion resistant nameplate affixed in a conspicuous location.
2. Nameplate information shall include manufacturer's name and address, equipment model number, and serial number.

B. Manufacturer

1. Supplier shall be ISO9001 certified and have a minimum 30 years experience as a manufacturer of municipal waste water equipment and a minimum 50 prior installations of similar equipment.
2. Supplier, at request, shall provide a list of reference sites for similar equipment for verification by the Engineer or Owner's Representative.
3. Supplier shall conduct factory testing and verification of equipment prior to shipment.
4. Supplier shall have factory owned bi-coastal service centers in USA.

C. Installation & Start-up

1. Supplier and provide services of a factory trained representative to check installation and review start-up of equipment and controls.
2. Supplier Representative shall inspect and approve site installation and supervise a review of the operation of the equipment.
3. Supplier Representative shall provide training on operation and maintenance requirements of the equipment.

PART 1 GENERAL (Cont'd.)

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging

1. Containers or skids shall be constructed for normal shipping, handling, and storage.
1. Containers shall provide adequate protection for the equipment in a dry indoor environment between +40° F (+4.5° C) and +100° F (+37.8° C).

1.6 WARRANTY

Manufacturer's standard 12-month limited warranty shall be provided on equipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Septage Receiving station(s) shall be in accordance with these specification and plans and shall be supplied by one of the following manufacturers:
 1. JWC Environmental, 290 Paularino Ave, Costa Mesa, CA 92626; Tel: 800-331-2277
www.jwce.com
JWC Environmental Series SRS3235 Honey Monster®-Septage Receiving Station
JWC Environmental Model PC2450 Controller.
 2. Approved equal.
- B. Manufacturers requesting to be selected as an approved equal shall submit certified documentation showing compliance with these specifications a minimum of ten (10) days prior to bid opening. Selected equipment manufacturers shall be added to the list of approved manufacturers.
- C. Selected approved equal manufacturers shall conduct an onsite test within ten (10) days of installation demonstrating compliance with all areas of this specification.

2.2 SEPTAGE RECEIVING SYSTEM(S)

A. General

The septage receiving station(s) shall effectively reduce, separate, wash and de-water septic waste that has been delivered to the system. The septage receiving station shall record transaction data and provide the information for use.

B. Performance

1. Septage receiving station(s) shall be rated for 1000 GPM (63l/s) clean water flow.
2. Septage receiving station(s) shall be rated for 15 PSI (103 kPa) maximum inlet pressure.

PART 2 PRODUCTS (Cont'd)

2.3 METAL TRAP

A. Description

The metal trap shall reduce inlet velocities to allow large metal and other large objects entrained in the process flow to be captured and removed at a convenient location. A manual knife gate shall allow the captured objects to be discharged into a debris receptacle for draining of excess liquid and disposal of the large objects.

A. Components

1. Metal Trap shall be constructed of AISI 304 stainless steel and PVC/ stainless steel knife gate.
2. A 4-inch cast aluminum male cam & groove fitting with removable cap shall provide connection to inlet feed hoses.
3. A velocity reduction zone shall reduce velocities to 3 ft/s (.91 m/s) at 375 GPM (23.6 l/s)
4. A manual knife gate shall be used to open the trap to release captured objects into the debris receptacle.
5. Debris receptacle shall have a 4-inch NPT drain and a removable basket with ½-inch (13 mm) perforations.

2.4 INLET PIPING

A. Description

Inlet piping shall provide connection between the metal trap, grinder, plug valve, flow meter, and tank.

B. Components

1. Inlet Piping shall be constructed of passivated AISI 304 stainless steel
2. Pipe segments shall have 4-inch class 150 lb weld neck flanges.
3. Gaskets shall be constructed of 1/8 neoprene rubber.
4. Fasteners shall be constructed of 18-8 stainless steel.

2.5 GRINDER

A. Description

Grinder shall reduce inlet solids for protection of other components and enhance the separation, washing, and de-watering process. Grinder shall be two shafted design consisting of individual cutters and spacers. Grinder shall have a single piece main body housing consisting of pipe flanges and inspection ports. Cutter cartridge shall be removable with the main body housing remaining in situ. Grinder shall have motor and speed reducer for cutter drive.

PART 2 PRODUCTS (Cont'd)

2.5 GRINDER

B. Components

1. Cutters and Spacers

- a. Cutting stack height shall be a nominal height of 12-inches (305 mm).
- b. Cutter shall be an individual disk constructed of ASTM 4130 alloy steel surface ground to thickness of .310-inches $+.000/-0.001$ (7.9 mm $+.000/-0.003$).
- c. Cutters shall be carburized to produce a hardness of 45-50 Rockwell C.
- d. Cutters shall have 7 cam shaped teeth. Tooth height shall not be greater than ½-inch (13 mm) above the root diameter of the cutter.
- e. Spacers shall be an individual disk constructed of ASTM 4130 alloy steel surface ground to a thickness of .319-inches $+.001/-0.000$ (8.1 mm $+.003/-0.000$).
- f. Spacers shall have a hardness of 34-38 Rockwell C.
- g. Spacers shall have a smooth outside diameter with no tooth profiles.

2. Shafts

- a. Shafts shall be constructed from ASTM 4140 alloy steel with a minimum tensile strength of 149,000 PSI (1,027 kPa).
- b. Shafts shall be measure a nominal 2-inches (51 mm) across flats of hex.
- c. Shafts shall be hardened to 32-38 Rockwell C.

3. Seal Cartridges

- a. Seal cartridges shall be rated to a maximum of 90 PSI (620 kPa).
- b. Seal cartridges shall not require flushing.
- c. Dynamic and rotating seal faces shall be tungsten carbide with 6% nickel binder.
- d. O-rings shall be Buna-N (Nitrile).
- e. Radial and axial loads shall be borne by sealed, oversized, deep-groove ball bearings.

4. Housings and Covers

- a. Main body, gear, base, and end housings shall be ASTM A536-84 ductile iron.
- b. Top cover and inspection port covers shall be ASTM A536-84 ductile iron.
- c. Main body housing shall have inlet and outlet flanges with bolt pattern machined to class 150 4-inch pipe flange size.

PART 2 PRODUCTS (Cont'd)

2.5 GRINDER (Cont'd)

B. Components (Cont'd)

4. Housing and Covers (Cont'd)

- d. Main body housing shall have integral side wall deflectors to direct solids into cutters.
- e. Inspection port covers shall be on both inlet and outlet sides of main body housing.
- f. End housing shall have integral bushing deflector to guide solids away from seal cartridges.

5. Speed Reducer

- a. Reducer shall be manufactured by Sumitomo Machinery Corporation of America.
- b. Reducer shall be internal planetary mechanism with trochoidal curved tooth profile.
- c. Reducer shall be a vertically mounted single 29:1 reduction.
- d. Reducer shall be grease lubricated.

6. Motor

- a. Motor shall be manufactured by Baldor Electric Company.
- b. Motor shall be 5 hp (4 kW), XPFC, 1725 rpm, 230/460 volt, 3 phase, 60 Hz.
- c. Motor shall have a minimum service factor of 1.00, 87.5% minimum efficiency factor at full load, minimum 80% power factor at full load.

C. Performance

- 1. Grinder shall have a maximum headloss of 11 inches (280 mm) of water column at 400 GPM of clean water (25 L/S).
- 2. Grinder shall provide a peak shaft torque of 4,246 lb-in/hp (643 Nm/kW).
- 3. Grinder shall provide a peak force at cutter tip of 1,831 lb_f/hp (10,921 N/kW).

2.6 PLUG VALVE

A. Description

The actuated plug valve shall provide security and regulate the process flow as controlled by the ultrasonic level sensor.

B. Components

1. Valve Body

- a. Valve body shall be manufactured by Milliken and cast of ASTM A-126 iron class B.

PART 2 PRODUCTS (Cont'd)

2.6 PLUG VALVE (Cont'd)

B. Components (Cont'd)

- b. Valve shall have 4-inch (100 mm) class 125 inlet and outlet flanges.
- c. Valve body shall have 316 SST sleeve type metal shaft bearings, sintered, oil impregnated permanently lubricated.
- d. The valve plug shall a cylindrical seating surface that is offset from the center of the plug shaft.
- f. The valve plug shall be 100% encapsulated with Buna-N, 70 shore and shall withstand 75 lbs pull under test procedure ASTM D-429-73 Method B.

2. Actuator

- a. The actuator shall be manufactured by Rotork and be model IQT125
- b. The actuator enclosure shall be rated NEMA 4/4x/6 (IP68).
- c. The actuator shall have a drive hand wheel for emergency manual operation.
- d. A hand held infra-red IQ Setting Tool shall be included to make setting changes without removal of any covers.

2.7 FLOW METER

A. Description

The flow meter shall provide a discrete pulse output to the controller providing flow measurement of the processed fluid in gallons or liters.

B. Components

- 1. Flow meter shall be manufactured by Endress+Hauser.
- 2. Flow meter body shall have class 150 4-ich inlet and outlet flanges.
- 3. Throat of flow meter body shall be coated with polyurethane.
- 4. Electrodes shall be AISI 316L stainless steel bullet nose type.
- 5. Control transceiver housing shall be rated NEMA 4X (IP67).

2.8 TANK ASSEMBLY

A. Description

The tank shall house auger assembly and spray wash assemblies for the purpose of separating undesirable solids from the processed fluid. The tank shall include covers for access and removal of the inclined screw conveyor for maintenance. The tank shall include mounting tubes for the ultrasonic level sensor. Two spray wash assemblies shall direct water onto to the captured solids and perforations of the incline screw screen trough for purposes of cleaning

PART 2 PRODUCTS (Cont'd)

2.8 TANK ASSEMBLY (Cont'd)

A. Description (Cont'd)

the captured solids. A third spray wash assembly shall direct water onto the tank walls for cleansing. The spray wash assemblies shall all be controlled from a single control loop with 1-inch NPT inlet connection.

B. Components

1. Tank

- a. Tank shall have a class 150 4-inch inlet flange.
- b. Tank shall have a 12-inch straight pipe discharge port.
- c. Tank shall be constructed of passivated 10 gauge AISI 304 stainless steel.
- d. Tank shall include lifting points for slings and separate lifting points for forklift.
- e. Tank shall include mounting points for spray wash assemblies.
- f. Tank shall have fully removable covers.

2. Spray Wash Assemblies

- a. Basket strainer shall be 304 stainless steel with 80 mesh screen.
- b. Y-strainer shall be bronze construction with a 20 mesh AISI 304 stainless steel screen.
- c. Solenoid valves shall be bronze body construction with a 120 volt AC Coil, explosion proof.
- d. Ball valves shall be manual and constructed of 304 stainless steel.
- e. Pipe and fitting shall be constructed of 316 stainless steel.
- f. Spray nozzles shall be constructed of 303 stainless steel, V-spray.
- g. Nozzles shall be AISI 303 stainless steel and rated 1.5 GPM @ 40 PSI.
- h. Tank spray rotating nozzle shall be AISI 304 stainless steel/ polypropylene and rated 10 GPM @ 40 PSI.

2.9 PIVOT SUPPORT

A. Description

Pivot Support shall provide a structure for positioning and lifting of the inclined screw in or out of the tank. Pivot Support shall allow 360° rotation of the inclined screw once removed from the tank. Pivot Support shall include a maintenance support stand for supporting of the inclined screw above the tank.

PART 2 PRODUCTS (Cont'd)

2.9 PIVOT SUPPORT (Cont'd)

B. Components

1. Support and stand shall be constructed of AISI 304 stainless steel.
2. Support shall include braces for positioning of the Pivot Support relative to the tank.
3. Support stand shall allow inclined screw to disengage from stand without disassembly.
4. Pivot Support shall support inclined screw at a 35° inclination.

2.10 INCLINED SCREW CONVEYOR

A. Description

Inclined screw conveyor shall separate, transport, de-water, and discharge captured solids. Inclined screw shall include a perforated screen trough, transport segment, de-watering segment, packing gland, drive, and rotor. The baffles of the screen trough shall create an overflow weir for protection of excess flow.

B. Components

1. Perforated Screen Trough

- a. Screen trough shall be constructed of AISI 304 stainless steel and electropolished to remove burrs.
- b. Perforations shall be ¼-inch (6 mm) diameter.
- c. Screen trough shall have baffles mounted on either side of the trough with replaceable ¼-inch neoprene seals attached to the baffles.

2. Transport Segment

- a. Transport segment shall be constructed of passivated AISI 304 stainless steel.
- b. Transport segment shall have 17-4PH wear bars.
- c. Transport segment shall be 19-11/16 inch (500 mm) flange to flange.

3. De-watering Segment

- a. De-watering segment shall be constructed of passivated AISI 304 stainless steel.
- b. De-watering segment shall have dual compartment design for shaft to enter in one compartment and captured solids into another compartment.

4. Packing Gland and Housing

- a. Packing shall be constructed of four (4) PTFE impregnated cords.
- b. Packing Gland housing shall be constructed of AISI 304 stainless steel.

PART 2 PRODUCTS (Cont'd)

2.10 INCLINED SCREW CONVEYOR (Cont'd)

A. Components (Cont'd)

5. Rotor

- a. Rotor shall be constructed of alloy steel.
- b. Lower section of rotor shall be 480mm diameter with ½-inch (12.7mm) groove for mounting of brush.
- c. Brush shall mount into groove and be secured with set screws.
- d. Rotor shall have a transition section from 480 mm to 285mm.
- e. Rotor shall have a double helix 285 mm section prior to compaction zone.
- f. Brush shall be single piece design with stainless steel backing and nylon bristles.

6. Speed Reducer

- a. Reducer shall be manufactured by Nord Gear Corporation
- b. Reducer shall be helical parallel shaft mounted with a 160:1 reduction.

7. Motor

- a. Motor shall be manufactured by Baldor Electric Company.
- b. Motor shall be 2 hp (1.5 kW), XPFC, 1725 rpm, 230/460 volt, 3 phase, 60 Hz.
- c. Motor shall have a minimum service factor of 1.00, 84% minimum efficiency factor full load, minimum 79% power factor at full load.

2.11 CONTROLLER

A. Description

A dual enclosure controller shall provide control of the septage receiving station components. The operator enclosure shall have a magnetic card reader, Operator Interface Terminal, printer and control devices for operating the system and providing data collection. The main enclosure shall have indicator lights, switches and other control devices.

B. Components

1. Enclosures

- a. Main enclosure shall be AISI 304 stainless steel NEMA 4X and house the control devices, motor starters, Emergency Stop and PLC.
- b. Operator Enclosure shall be AISI 304 stainless steel NEMA 1 and house the printer, magnetic card reader, OIT with compact flash memory card recorder, and Start & Stop pushbuttons.

PART 2 PRODUCTS (Cont'd)

2.11 CONTROLLER (Cont'd)

B. Components (Cont'd)

2. Magnetic Card Reader (Operator Enclosure)
 - a. Card reader shall be manufactured by ID-Tech.
 - b. Card reader shall be rated for outdoor use.
 - c. Card reader shall provide identification and authorization for use of the system.
3. Printer (Operator Enclosure)
 - a. Printer shall be manufactured by Infinite Peripherals.
 - b. Printer shall use 80 mm wide single roll thermal paper.
 - c. Printer shall print a transaction receipt that lists site address, date, time, user ID, and total flow processed.
4. Operator Interface Terminal (Operator Enclosure)
 - a. OIT shall be manufactured by Red Lion.
 - b. OIT shall be rated for outdoor use.
 - c. OIT shall display fail, service reminder and operational messages.
 - d. OIT shall display Volume, Tank Level and Valve Position when processing a transaction.
 - e. OIT shall allow for a programmable system cleaning cycle.
 - f. Recorder shall store transaction data and provide transfer of the data via a memory card reader as a CSV file to a Personal Computer.
 - g. A custom template that formats the data shall be provided on CD.
6. Start & Stop Pushbuttons (Operator Enclosure)
 - a. Pushbuttons shall be rated NEMA 4X.
 - b. Start pushbutton shall initiate operation of the system after successful identification and authorization of the user's PIN has been entered via the card reader or OIT.
 - c. Stop pushbutton shall initiate a stop of the system and immediately stop the grinder motor, and close the plug valve. Transaction data shall be written to the PLC data register and a transaction receipt printed. Tank spray wash solenoid shall energize and operate along with the auger motor and auger spray wash for the duration of the cleaning cycle.

PART 2 PRODUCTS (Cont'd)

2.11 CONTROLLER (Cont'd)

B. Components (Cont'd)

7. Grinder ON/OFF/AUTO three-position keyed selector switch. (Main Enclosure)
 - a. In the ON position, the grinder shall run continuously.
 - b. In the AUTO position, the grinder shall operate as controlled by the START and STOP pushbuttons.
8. Auger ON/OFF/AUTO three-position keyed selector switch. (Main Enclosure)
 - a. In the ON position, the auger shall run continuously.
 - b. In the AUTO position, the auger shall operate as controlled by the START and STOP pushbuttons.
9. Plug Valve OPEN/CLOSE/AUTO three-position keyed selector switch. (Main Enclosure)
 - a. In the OPEN position, the plug valve will open.
 - b. In the CLOSE position, the plug valve will close.
 - c. In the AUTO position, the plug valve will open and close as controlled by the ultrasonic level sensor mounted on the tank.
10. RESET momentary two-position keyed selector switch. (Main Enclosure)
 - a. Switch shall be rated NEMA 4X
 - b. Reset switch shall clear any fault condition and rest system for operation.
11. Pilot Lights (Main Enclosure)
 - a. Lights shall be LED type rated NEMA 4X.
 - b. Lights shall indicate GRINDER RUN, AUGER RUN, PLUG VALVE OPEN and FAIL.
12. Emergency Stop Pushbutton (Main Enclosure)
 - a. Emergency Stop Pushbutton shall be rated NEMA 4X.
 - b. When activated Emergency Stop shall close plug valve, stop all motors and de-energize solenoid valves.
13. Motor Starter and Control Transformer (Main Enclosure)
 - a. Starter shall be a full-voltage reversing type with 120 volt operating coils.
 - b. Overload relays shall be adjustable and sized to full load amperes (FLA) of the motor.

PART 2 PRODUCTS (Cont'd)

2.11 CONTROLLER (Cont'd)

B. Components (Cont'd)

14. Programmable Logic Controller (Main Enclosure)

- a. PLC shall be manufactured by Panasonic.
- b. PLC shall have a minimum of 16K of memory.
- c. PLC shall be able to store 1000 transactions

C. Safety Features

1. When a grinder jam condition occurs while the system is operating, the controller shall stop the grinder, then reverse the grinder rotation to clear the obstruction. If the jam is cleared, the controller shall return the grinder to normal operation. If three reverses occur within a 30 second interval, the controller shall de-energize the grinder motor and activate the grinder FAIL indicator and relay. The auger shall continue to operate.
2. When an inclined screw jam condition occurs while the system is operating, the controller shall stop the screw, then reverse the screw rotation to clear the obstruction. If the jam is cleared, the controller shall return the screw to normal operation. If two reverses occur within a 30 second interval, the controller shall de-energize the grinder motor and activate the auger FAIL indicator and relay. The grinder shall continue to operate.
3. When a power failure occurs while the system is operating, the transaction shall terminate. Once power is restored, a receipt shall print.
4. When a power failure occurs while the grinder or auger is in a fail condition, once power is restored the fail indicator shall reactivate and remain until reset.
5. Reset shall only be from the main control only.

PART 3 EXECUTION

3.1 INSTALLATION

Septage Receiving Station(s) and controller(s) shall be installed in accordance with the supplier's installation instructions, and in accordance with all OSHA, local, state, and federal codes and regulations.

3.2 TESTING

Test the Septage Receiving Station to demonstrate correct alignment, smooth operation and freedom of excessive vibration and noise. Test period shall include one cycle of processed fluid that demonstrates accurate measurement of the flow and all run cycles are properly set.

3.3 TRAINING

A field training course shall be provided for operating and supervisory staff members. Field instruction shall cover all items contained in the operation & maintenance manuals.

END OF SECTION